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# Macroeconomic Stabilization for a Post-Pandemic World:

## Revising the Fiscal-Monetary Policy Mix and Correcting Macroeconomic Externalities

Anton Korinek

The Brookings Institution

Joseph E. Stiglitz

Columbia University

**Abstract**

This paper argues that the traditional canonical model of macroeconomic stabilization—which placed the main burden of stabilization on monetary policy—is outdated and urgently needs to be replaced. Since the Great Financial Crisis of 2008/09, the main tool of central bankers, the short-term interest rate, has more often been constrained by the zero lower bound than not. Moreover, recent events have highlighted that monetary policy is too blunt to target specific drivers of inflation such as supply chain disruptions, labor market shortages, or shocks to energy prices. However, they can be targeted by fiscal measures. Fiscal policy should therefore play a more prominent role and complement monetary policy in macroeconomic stabilization. Moreover, fiscal policy can also account for the pervasive macroeconomic externalities that generate economic inefficiencies and hold the economy back from reaching its full potential, for example by mitigating risks, lessening the need for precautionary savings, and reducing capital market imperfections. All of these can positively affect both the supply and demand side of the economy in targeted and welfare enhancing ways.

Anton Korinek is a Rubenstein Fellow at Brookings and a Professor of Economics at the University of Virginia. Joseph Stiglitz is a University Professor at Columbia University and the Chief Economist of the Roosevelt Institute. Email addresses: AKorinek@brookings.edu and jes322@columbia.edu. They would like to thank Eduardo Dávila, Martin Guzman, Kinda Hachem, Eric Leeper, and David Wessel for helpful comments.

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# 1. Introduction

The U.S. and other advanced economies have recently experienced some of the highest rates of consumer price inflation in decades. We argue in this paper that the current macroeconomic situation calls for a policy response that differs from the canonical consensus that had shaped macroeconomic stabilization policy for most of the past decades—a policy response that does not rely exclusively on monetary policy but focuses on fiscal policy and how fiscal measures can address the macroeconomic externalities that we are currently experiencing, relieving shortages and bottlenecks so as to both stabilize inflation and strengthen economic activity. The process of rethinking the canonical consensus started after the Great Financial Crisis of 2008/09, but we argue that further progress is needed. We discuss a class of models and a research agenda focused on macroeconomic externalities that we believe are crucial for how public policy can promote greater macroeconomic stability as well as greater economic efficiency and welfare.

We start by describing what we call the canonical model of macroeconomic stabilization policy of the late 20th century, which captured a widely held consensus view that macroeconomic stabilization is the exclusive domain of monetary policy, relegating fiscal policy to focus on other objectives. However, this role assignment ignored a long list of downsides of monetary policy that we detail below, including that interest rates are a rather blunt tool, that monetary policy distorts and discourages investment, and that it has significant distributive implications that are not sufficiently accounted for. More generally, we observe the ways in which the canonical model of macroeconomic stabilization has frequently been influenced by simple models of the economy that were extended beyond the context for which they were designed, leading to biased economic policies.

Given the excessive reliance on monetary policy in recent decades, the canonical consensus model was bound to lead central bankers to "run out of powder," giving rise to the re-emergence of fiscal policy as a central tool of macroeconomic stabilization. For example, if excess demand is judged to be an important contributor to inflationary pressures, a well-tailored fiscal policy response—modestly increasing taxes on high-earners and delaying non-urgent fiscal expenditures—is likely to be better than relying exclusively on monetary policy.[1]

Macroeconomics has traditionally focused on aggregates, like GDP and employment, but beneath those aggregates are individual firms and households, engaged in a myriad of activities across a myriad of sectors, and normally, when the economy is working well, these details matter little for those interested in the performance of the aggregates. But in periods of large structural shifts and dislocations—as in the aftermath of the pandemic—understanding what is happening to the aggregates and designing good policies requires looking beneath the surface. When, as now, productivity is stagnating or declining, something *else* is going on: it is not that we have forgotten how to produce goods and services. It is not that a large fraction of our productive capacity has been destroyed in a war or by a natural disaster. Resources are, in some sense, being misallocated, and there are impediments to reallocating them. In such circumstances, the naïve and simplistic use of traditional macroeconomic models that focus on aggregates may be misguided, or even dangerous.

Our paper argues further that the design of fiscal policy can and should pay attention to the myriad of macroeconomic externalities that are present in the economy. These externalities arise because the decisions of individual economic actors do not lead to efficient outcomes when there are market

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1. The proposed fiscal policy has a further advantage, particularly in the eyes of those worried about the size of the national debt and deficit, that both will shrink.

imperfections (as there always are), and this generates a role for policy to enhance both efficiency and stability.

In the context of the post-pandemic economy, concerns over inflation have moved to the top of the agenda. Our paper focuses on several specific macroeconomic externalities in this context. [2] We note that labor shortages are made more severe because individuals do not internalize the positive externalities from returning to the labor force, justifying active labor supply policies. Moreover, supply bottlenecks give rise to negative externalities because individual firms do not face the costs that such dislocations impose on the rest of the economy in terms of higher prices and idled resources, providing a rationale for active policies to relieve supply bottlenecks. Finally, we observe that increases in industry concentration may have made it easier for firms to raise prices and sustain implicit collusion once the shortages subside. We provide several economic models to illustrate these observations more analytically in boxes that complement the main text.

## 2. Revising the Fiscal-Monetary Policy Mix

### 2.1. The Canonical Model of Macroeconomic Stabilization Policy

For much of the past few decades, macroeconomic policy has leaned too heavily on the canonical model of macroeconomic stabilization policy of the late 20th century, heavily influenced by the tenets of neoliberalism. Part of this model was that fiscal policy was viewed as either too slow or too ineffective for macroeconomic stabilization. It was seen as too slow to react because major fiscal reforms frequently took many months to enact and even longer to implement—although the quick response to both the Great Financial Crisis of 2008 and the pandemic have proven this wrong. It was seen as ineffective because of a misguided application of "Ricardian equivalence" results that were inappropriately interpreted as suggesting that fiscal policy is ineffective since extra spending by government will be completely undone by consumers who will feel compelled to increase their savings by an equivalent amount. (The theoretical results are about the timing of taxation and hold only under highly restrictive and unrealistic assumptions; there is ample empirical evidence that they do not hold in practice). As a result, active fiscal policy was only used as a measure of last resort—mainly for stimulus in extraordinary crisis situations.

Monetary policy was also viewed as both more neutral and more fine-tuned than fiscal policy. It was considered more neutral than fiscal policy because it does not explicitly pick its targets—interest rate policy reaches all borrowers and "gets in all the cracks," as observed by Jeremy Stein in 2013. Monetary policy was considered more fine-tuned because interest rates were reviewed and updated according to a regular schedule that ensures that monetary policy is adjusted to the state of the economy—the FOMC holds eight regularly scheduled meetings per year and schedules emergency meetings when necessary.

In many ways, the consensus has shifted, and we now think the opposite—monetary policy is frequently out of powder and thus ineffective, and fiscal policy is the instrument that is left. (To be sure, there are also other public policies that are macroeconomically relevant in specific circumstances and that have sometimes been given insufficient attention, such as debt restructuring in the aftermath of real estate bubbles and financial crises, or public health measures in the wake of pandemics.) Moreover, we will argue that even when monetary policy is unconstrained, it is desirable for macroeconomic

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2. The Inflation Reduction Act of August 2022 included some provisions that modestly reduced aggregate demand, and some that addressed (again modestly) supply side issues, thus reducing inflationary pressures from both the demand and supply side. President Biden's original Build Back Better proposals included several additional supply side measures, including some that would affect labor force participation.

stabilization policy to rely less heavily on monetary policy and shift part of the burden of stabilization to fiscal policy.

### 2.2. What Was Wrong About the Canonical Consensus View

The consensus view on monetary policy was ill-advised for several reasons, and many of the problems are related to overly simplistic models of the economy that were extended beyond the context for which they were designed.

First, the most effective instrument of monetary policy—the short-term interest rate—is rather blunt. It is a single instrument to affect aggregate demand in the economy in broad strokes, but it cannot be fine-tuned to which sectors of the economy are over-heated or in need of stimulus. But rather than being a "neutral" instrument that affects everyone in the economy equally, monetary policy affects interest-sensitive sectors such as housing and other real estate much more strongly than other sectors. At times, this gives rise to serious distortions—for example, when overall demand is weak and the economy needs stimulus, expansive monetary policy may inflate bubbles such as the housing bubble of the early 2000s. These effects are not present and cannot be analyzed in simple models that do not sufficiently account for the sectoral structure of the economy, such as the basic textbook New Keynesian models that we teach to graduate students. However, they are nonetheless real. Less conventional instruments such as quantitative easing may be somewhat more targeted (e.g., by purchasing mortgage bonds rather than Treasuries), but were not able to adequately resolve demand shortages.

Second, a stark difference between fiscal and monetary policy is that monetary policy affects aggregate demand more through investment whereas fiscal policy, particularly that related to the overall size of the fiscal deficit, operates comparatively more through (private and public) consumption—investment is inherently about the intertemporal trade-offs that monetary policy targets. As a result, monetary policy affects not only the demand side but also the supply side of the economy. In particular, restrictive monetary policy reduces investment in future productive capacity, potentially exacerbating future inflationary pressures. While many investments impact inflation only in the medium term, some have effects within the same time horizon over which monetary policy operates (generally viewed as up to 18 months). Investments in converting commercial real estate into housing could affect the supply of housing relatively quickly; so too, investments in fracking could affect energy markets in the U.S. Even supply effects that lie further in the future may affect present inflation by influencing expectations. Perhaps most importantly in the current situation, when there are supply constraints, restrictive monetary policy reduces incentives for investments to mitigate the constraints, which may compound inflationary pressures in the economy. Going forward, tackling climate change and transforming our economy to become greener will require large investments that will be handicapped if interest rates are too high. In short, policymakers need to take note of the comparative effects on investment versus consumption when deciding on the fiscal-monetary policy mix.

Third, the canonical consensus view was built on a misguided view of how monetary policy works. According to the simplest New Keynesian textbook models, monetary policy works mainly via substitution effects, i.e., lower interest rates make it more desirable to consume and invest today because you earn less if you save. Income effects are by design absent, since the textbook model focuses on a representative agent. In practice, the intertemporal substitution effects of interest rates play a far smaller role in resource allocations than simple textbook models suggest. As monetary policy practitioners have long known, most of the real effects of monetary policy occur through other transmission channels—monetary policy affects financial conditions and asset prices, for example via the *bank lending channel* and the *balance sheet channel*, by driving *market liquidity* and by influencing the extent of *credit rationing* or availability.

Some sectors and some firms are more reliant on bank lending and more subject to credit rationing than others—and therefore more affected by changes in monetary policy. There are also significant *income effects* associated with monetary policy, driven by asset price changes and wealth redistributions between economic agents, which matter when financial markets are incomplete and there are credit constraints. This redistribution, including inter-generational redistribution, not only can have large macroeconomic consequences, reversing the substitution effects at the center of the standard model, but also important implications for inequality. Much of this has been highlighted in recent academic work on monetary policy—for example, the literature on HANK models or on the redistributive effects of monetary policy. Another channel that is absent in simple closed-economy textbook models is the exchange rate channel: some sectors are affected much more by changes in the exchange rate than others. All this illustrates that there are many distortions arising from the channels through which monetary policy affects the economy and that are not captured in simple aggregate benchmark models.

Fourth, monetary policy has direct effects on pricing that go in the opposite direction of what is suggested by simple textbook models. In many sectors of the economy, interest rates have a direct effect on costs, that then get passed on to prices. This is particularly relevant in the housing sector: rents and owners' equivalent rent make up close to a third of the CPI basket. To the extent that rents reflect the underlying cost of capital, higher interest rates actually *increase* rents—a theoretical observation confirmed by the data[3] and of particular relevance now, when increasing rents are an important contributor to today's inflation. Higher interest rates also reduce the supply of housing in a variety of ways that may feed into higher rents, e.g., by discouraging mortgage holders who have locked in low interest rates from selling.[4]

Fifth, standard New Keynesian models capture only in a very rudimentary fashion how firms make pricing decisions in an imperfectly competitive economy. In general, firms will consider a variety of variables when deciding how to set their markups and prices, including intertemporal state variables, but this is ruled out by assumption in simple New Keynesian models that build on Dixit-Stiglitz preferences that lead to fixed markups. For example, Phelps and Winter described an economy in which firms have to trade off the potential gain from raising prices today against the risk of losing customers and the value of profits foregone in the future, introducing an intertemporal consideration into pricing decisions. An increase in interest rates or tighter financial conditions tilt the balance towards raising prices today, *increasing* inflation, and this may be especially so now, given the uncertainty associated with the post-pandemic economy and the new Cold War. We discuss the implications in greater depth below. The same forces may also contribute to explaining why wages are not rising in the face of an allegedly tight labor market: lowering real wages induces workers to search for alternative jobs, but the resulting costs in terms of higher turnover occur in the future whereas the benefits occur today.

Sixth, monetary policy distorts relative factor prices and factor earnings—for example, low interest rates reduce the cost of capital without directly affecting the cost of labor. Over the past decades, this increased incentives for automation and may therefore have contributed to greater wealth inequality. Again, these effects cannot be explained in simple textbook models with a representative agent—they only occur when there are multiple types of agents in the economy.

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3. Dias and Duarte find that the elasticity of rents to identified monetary policy shocks is about one half within a year and three quarters after 30 months. Given the large weight of rents in the CPI basket, a one percentage point hike in interest rates raises consumer price inflation by about a quarter point.

4. Over the medium term, higher interest rates reduce housing supply, putting upward pressure on rents, and the implied increased capital gains for homeowners may contribute to lock-in effects, especially for middle to upper income individuals.

### 2.3. How Overly Simplistic Models Can Distort Policy Analysis

All models represent simplifications of reality. One must be careful, though, in the choice of simplifications and the lessons that one derives. Some models are useful teaching devices and instructive for showcasing specific economic forces at work, but dangerous when taken literally in a policy context. We have already noted one instance: using an aggregate production function eliminates the possibility of sectoral distortions and leads one to focus on intertemporal distortions—even when the former may be far more important than the latter. Similarly, assuming that the central distortion in the economy is nominal wage rigidities leads to a natural policy prescription: increase labor market flexibility—that is, allow wages to fall when there are demand shortages, which may further depress aggregate demand in recessions and exacerbate macroeconomic volatility.[5] As a third example: treating government expenditure as a single variable, "G," ignores the multiple ways that well-designed fiscal policy can be used to address the multiplicity of macroeconomic problems *simultaneously*. Finally, *real rigidities,* limitations in the ability of reallocating labor and capital across sectors or even between uses within a sector, can have first order effects on productivity, and give rise to large macroeconomic externalities, as we explain more fully below.[6]

A long-time criticism of the canonical consensus model was its implication that policies that enhance price stability would lead to *real* stability—which is, after all, what is of real concern. But more generally, this is true neither in theory (using a broader range of models) nor in practice. For example, as already emphasized by Irving Fisher, small amounts of inflation can be very useful in the recovery from financial crises that involve high levels of nominal debts.

## 3. The Re-Emergence of Fiscal Policy

As we noted earlier, given the excessive reliance on monetary policy, the canonical consensus model was bound to lead central bankers to "run out of powder," i.e., to use monetary stimulus up to the point where nominal interest rates hit their lower bound close to zero and traditional monetary policy was no longer available, as most advanced countries experienced over much of the past decade and a half.[7] This has led to a renewed focus on the role that fiscal policy can play. Fiscal policy is, of course, not a panacea—for example, fiscal policy may also risk "running out of powder" if policymakers lean too heavily on fiscal spending without increasing fiscal revenue and, as a result, debt/GDP ratios continue to increase for some time. Moreover, it is subject to political economy challenges that we describe in further detail below.

However, fiscal policy has the potential of not only engaging in macroeconomic stabilization but also targeting the macroeconomic problems at hand more directly—for example, the labor shortages and supply bottlenecks that we are currently facing. When there is political will, fiscal policy can be enacted quickly—as has been repeatedly demonstrated over the past two decades, especially during crisis situations. Moreover, greater weight can be placed on automatic fiscal stabilizers that kick in on their own when the need for fiscal support arises.

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5. Aside from its macroeconomic effects, cutting wages is a particularly problematic policy prescription in an era where a central economic, political, and social problem is inequality.

6. For example, these rigidities have been put forward as key drivers of both the Great Depression and the Great Recession.

7. Although central banks engaged in quantitative easing during those periods, they were not able to provide the amount of stimulus that would have been needed to restore macroeconomic equilibrium.

### 3.1. The Role of Macroeconomic Externalities

Fiscal policy can be better fine-tuned to address macroeconomic externalities. Macroeconomic externalities are situations in which the proverbial "Invisible Hand" of the market is not working properly. They occur when the private sector allocates resources inefficiently, in a way that interferes with macroeconomic efficiency and stability—just like unregulated private sector actors generate excessive pollution when there are environmental externalities.

Macroeconomic externalities are—by definition—not present in simple benchmark models of perfect markets, in which the First Fundamental Theorem of Welfare Economics holds. However, the real world contains myriads of market failures that represent marked deviations from the benchmark, and frequently in very significant ways. A stark example are the macroeconomic externalities that play out during economic crises. During the Great Depression and Great Financial Crisis, for example, fire sales of financial assets and real estate gave rise to fire-sale externalities, whereby each individual seller pushed down prices further and did not internalize that their individual behavior hurt all others – and the economy as a whole. Similarly, the paradox of thrift during these episodes captured that an individual agent who saved more would reduce aggregate demand by an equivalent amount and—when output is demand-determined, as it is, e.g., during a liquidity trap—would therefore deprive other agents in the economy of demand.

Early economists such as Irving Fisher and John Maynard Keynes described these mechanisms verbally, and policymakers have long had an intuitive appreciation of such externalities as motivation for policy measures that they advocated. However, mainstream economics has only recently started to pay attention to macroeconomic externalities and to the scope for policy intervention that they give rise to, and the canonical model of macroeconomic stabilization ignored them altogether. Building on the work on pecuniary externalities by Greenwald and Stiglitz (1986, 1993), Lorenzoni (2008) and Jeanne and Korinek (2010, 2018, 2019) characterized how fire-sale externalities create a scope for both macroprudential policy intervention as well as stimulus policies. Farhi and Werning (2016) and Korinek and Simsek (2016) identified private actions that contribute to demand shortages or overheating through aggregate demand externalities. Such macroeconomic externalities call for government intervention both *ex ante,* to reduce the frequency and intensity of fluctuations, and *ex post*, after a downturn has occurred, including through bailouts, to mitigate the consequences and restore macroeconomic stability as quickly as possible. They provide a central part of the justification for regulations, including financial and capital market regulations, and for active fiscal and monetary policies.

An externality perspective recognizes that in an environment with multiple market failures, economic actors may make decisions that are privately rational but give rise to coordination failures and inefficient equilibria.

### 3.2. Macroeconomic Externalities in a Post-Pandemic World

The present macroeconomic environment is characterized by a number of macroeconomic externalities—externalities that are in many ways the opposite of what occurred during previous crises. In the following, we will first discuss the current episode of inflation in general and then zoom in on three phenomena that are associated with macroeconomic externalities that are particularly pertinent and that create a role for fiscal policy: labor shortages, supply bottlenecks and the interaction of market power with inflation dynamics.

The current level of inflation is higher than most consumers have experienced in decades. This experience is shared by most advanced countries, suggesting that the primary drivers are global factors such as pandemic-induced supply bottlenecks and the Russian invasion of Ukraine. Additional relevant

factors may include a) widespread tightness in the labor market, driven by lower labor force participation and lower migration during the pandemic; b) excesses of demand, created by pent-up demand; and c) other developments giving firms with market power an opportunity or incentive to increase margins. Some attribute significant parts of the inflation to particular policies followed during the pandemic, e.g. the U.S. programs that resulted in higher unemployment than in other advanced countries, where there was more emphasis on keeping workers connected with their firms, may have contributed to the larger decline in labor force participation, or higher pandemic-related fiscal support during the Trump and Biden administrations in the US may have contributed to a greater imbalance between demand and supply in the U.S.[8] It has proven difficult and controversial to precisely parse out the relative contribution of these factors to today's inflation. However, most of the points made in this paper hold regardless.

Inflation results from the decisions of individual actors throughout the economy to increase the prices they charge—yet it is rational for individuals actors not to internalize how they collectively affect the overall price level and aggregate demand, giving rise to aggregate demand externalities that are at the heart of why macroeconomic shocks lead to demand imbalances and why there is a role for macroeconomic stabilization policy. There are a number of additional social costs generated by inflation. Because debt contracts are not in general indexed, inflation gives rise to significant redistributions among households, firms, and financial institutions, leading to dislocations in their net worth positions that in turn have macroeconomic effects. Given that prices and wages are adjusted sluggishly, inflation generates dispersion in prices and wages and in the associated demand for goods and factors, which, when inflation is high enough, can have significant allocative effects, which again individual agents in their price setting don't take into account. Moreover, in practice, all the described effects are subject to deep uncertainty—firms and workers do not know the probability distributions of how prices and wages will change in the future, giving rise to precautionary behaviors and shortened planning horizons that themselves generate macroeconomic externalities, especially once inflation rates are in the double digits.

### *3.2.1. Labor Shortages*

The current post-pandemic job market appears tight and has given rise to shortages—not necessarily because aggregate demand is that robust, but because the labor force has contracted. In fact, the labor force in the U.S. economy is still below its peak in December 2019, despite the population growth that has occurred in the intervening two and a half years[9] (which in turn was lower than anticipated then, both because of lower migration and the large number of pandemic-related deaths). By mitigating these pressures, a worker who re-enters the labor market now—or an additional immigrant—would confer significant benefits to the macroeconomy.

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8. We note, however, that the resulting increase in cash balances have not been spent down (except to make unusually high tax payments associated with capital gains). Moreover, countries that spent more on fiscal support do not seem to have significantly different levels of inflation from those that spent less. Furthermore, the sectors that were particularly affected by inflation are not the ones where inflation would been expected if overheated demand was the underlying driver of inflation. Not spending excessive cash balances in the short run is consistent with consumption smoothing and is especially to be expected given the continuing high levels of uncertainty.

9. The working age population has thus shrunk relative to what was anticipated, but so has labor force participation, resulting in an employment/working age population ratio that is significantly lower than pre-pandemic, and an employment/population ratio that is even further below pre-pandemic levels.

**Box 1: Labor shortages and aggregate demand externalities**

Consider a consumer-worker with, in the usual notation, utility function $U = C - d(L)$ and a representative firm that combines labor $L$ with non-labor inputs $N$ to produce output according to a constant-returns production function $Y = F(L, N)$, where $N$ corresponds to factors such as natural resources, capital, or intermediate goods. We denote the wage by $w$ and assume that $N$ is purchased in international markets, where it is supplied perfectly elastically at exogenous price $x$.

**Frictionless markets** give rise to an economy that achieves the first best. The representative firm combines labor and non-labor inputs in optimal proportions, giving rise to a linear cost function with marginal cost $MC(w, x)$, which pins down the price of final goods $P = MC$. The consumer's optimal choice of labor supply equates the marginal disutility of labor to the real wage, $d'(L) = w/P$. In the figure below, the left-hand side of this equilibrium expression is represented by the hyperbolic $L^S$ curve, and the right-hand side by the dashed horizontal line, which is independent of the amount of labor employed. The intersection between the two determines the optimal level of production.

**Wage Rigidities** Let us now consider the situation if the nominal wage is rigid at a level $w = \bar{w}$. If this is the case, labor supply is still determined by the consumer's optimality condition $d'(L) = \bar{w}/P$, represented by the same $L^S$ curve in the figure. Firms still price output at marginal cost $P = MC$. However, the wage no longer correctly reflects the marginal social value of labor. If the wage is too low, consumers supply too little labor, and firms' labor demand is rationed, forcing them to resort to a suboptimal ratio of factor inputs $N/L$, inefficiently raising their costs. ($N$ is chosen so that $F_N(N, L) = x$, where $L$ is fixed.) This is reflected in a convex cost curve and a marginal cost that is greater the further away the firm is from its optimal factor input ratio. The result is illustrated by the U-shaped marginal cost curve MC (for any given quantity produced) in the figure below; the curve forms a tangent on the [dashed] first-best marginal cost curve without labor market distortions.

This equilibrium has several noteworthy properties. An exogenous increase in the cost of non-labor factors—for example, an oil shock—pushes up the MC curve, which increases goods prices and leads to a decline in real wages, reducing labor supply and exacerbating the labor market imbalances, thereby generating amplification, as illustrated by the arrows in the figure. Similarly, an exogenous reduction in the willingness to work $d(L)$ pushes the $L^S$ curve left, increasing rationing and raising the marginal cost of firms, which leads to similar amplification. Graphically, equilibrium is determined by the intersection of two downward-sloping curves, implying that small shifts may give rise to large and amplified equilibrium responses.

**Macroeconomic Externalities** Decentralized actors do not take these feedback effects into account since they take wages, prices, and the tightness of the labor market as given. Therefore, there are several macroeconomic externalities:

**Proposition 1** Workers do not work the socially efficient amount – a planner would subsidize labor, which would relieve the supply shortages, reduce marginal costs and wages, and increase output closer to the efficient level

**Proposition 2** Firms do not have sufficient incentives to reduce the cost of non-labor inputs by relieving supply bottlenecks. A planner would subsidize any actions that reduce marginal costs because this would reduce cost pressures, increase real wages and bring the economy closer to an efficient level of output.

Similar results apply to ex-ante actions that reduce the risk or magnitude of shocks that increase costs, such as larger inventories, longer-term contracts with appropriate contingencies, or investments into more reliable supply chains.

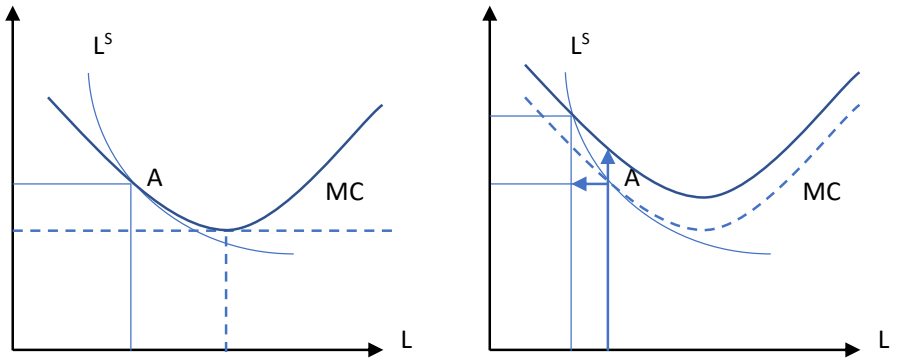


Figure 1: Amplification of labor market shocks under wage rigidities

The benefits of relieving labor shortages go far beyond what is reflected in the incomes of individual workers because of the resulting macroeconomic externalities, for example because they relieve specific labor shortages. However, since the labor market does not signal these benefits in the wages that it offers to workers, they do not face sufficient incentives to re-join the work force, and the labor force is smaller than what is desirable from a social perspective. We lay out a simple analytic model of macroeconomic externalities in the context of labor shortages in Box 1. The model describes an economy in which nominal wages are sticky, so they do not accurately reflect the scarcity and social value of labor. As we show in the box, this may give rise to macroeconomic externalities.

These macroeconomic externalities call for subsidies to workers who rejoin the labor market—just like environmental externalities call for taxes or subsidies. We capture this formally in Proposition 1 in Box 1. Improving work conditions and access to childcare and allowing for additional immigration would also help. Moreover, if wages are suppressed by monopsony power on the part of employers or nominal and real wage rigidities, the resulting distortion now generates an efficiency cost in addition to the usual one upon which microeconomics focuses. The arguments for reasonable minimum wages are reinforced. Similarly, if monopsony power has resulted in the deterioration of working conditions, as evidenced by just-in-time scheduling or split schedules, that too affects labor supply, especially towards certain sectors/employers, and regulations prohibiting such practices would trigger positive macroeconomic externalities.

### *3.2.2. Supply Bottlenecks*

The post-pandemic economy is also plagued by pandemic-related supply bottlenecks and supply chain disruptions that have pushed up inflation in the affected sectors. Box 2 presents a simple analytic model that illustrates how supply shortages may give rise to consumer price inflation and an associated decline in real wages.

Supply bottlenecks were particularly visible in the automotive industry, in which acute shortages of chips—which typically make up just a tiny fraction of the overall value of a car—even led to the idling of factories, wasting the productive capacity of large numbers of workers and significant amounts of capital. By mitigating the bottleneck, a chipmaker who reallocates their production from a sector with less severe shortages—or from a sector with a less important macroeconomic role, say iPhones or TV screens—to the car industry would generate large positive effects on the macroeconomy—benefits that are not fully reflected in the price of chips because individual chipmakers and automakers do not consider the macroeconomic benefits of relieving supply shortages when they contract with each other. Adjusting production processes takes time, and given that most firms have uncontingent long-term contracts, the speed of reallocation of production processes is inefficient from a macroeconomic perspective. If government can shift resources to relieve the supply bottlenecks, it would have the macroeconomic benefits of lower inflation and fewer idled factories. Proposition 2 in Box 1 on aggregate demand externalities spells out these results more formally within the model we develop there. More generally, the market prices of chips and other goods for which we face shortages do not correctly reflect these macroeconomic externalities and do not signal the scarcity and social value that they generate.

**Box 2: Supply bottlenecks, stagflation and implicit collusion**

Consider a consumer-worker with utility function $U = u(C) - L$ and two oligopolistic firms that combine labor $L$ with additional inputs $K$ to produce output according to a production function $F(K, L) = AK^a L^{1-a}$. The inputs $K$ may include capital such as machinery and equipment as well as intermediate goods. The two firms buy $K$ at a given rate $R$ from international markets and hire labor at a wage $w$ from the consumer-worker, where we pick $w = 1$ as the numeraire. The firms compete in Cournot fashion and sell their output at market price $P$.

The consumer's demand is given by $P = u'(C)$, which defines the demand curve indicated in the left panel of the figure below.

**Pre-shock** Before the shock, the firms compete in Cournot fashion – each firm $i$ decides how much to produce, $Y_0$, taking the other firm's production as given. At the optimum, each firm's marginal revenue from additional production equals its marginal cost, $MR(Y_i) = MC(Y_i)$, as illustrated in point A in the left Figure. In this equilibrium, firms set price $P_0$, charging a markup $m$ over their marginal cost, which reduces the real wage $w/P_0$ below the level that would prevail under perfect competition, and by extension lowers employment and output. Firms' profits equal $\Pi_0 = P_0 Y_0 - C(Y_0)$.

**Supply bottlenecks** Suddenly, firms experience a supply bottleneck that restricts the non-labor inputs that they can contractually access to $K \leq \widehat{K}$. As illustrated in the right panel of the figure below, this creates a kink in firms' cost curves once the input level exceeds $\widehat{K}$, as firms need to substitute for the missing input supplies using the factor(s) that are still available. The more difficult the missing inputs are to substitute, the steeper the rise in the cost curve beyond the kink; in the limit, the cost curve simply turns vertical.

Faced with this situation, the two firms find it optimal to reduce output to $Y_1 < Y_0$, as illustrated by point B in the right Figure. They raise prices to $P_1$, thereby reducing real wages, employment, and output further and making the consumer-worker worse off, triggering stagflation. The resulting level of profits is $\Pi_1 = P_1 Y_1 - \hat{C}(Y_1)$.

**Implicit collusion** Even when the supply bottleneck is relieved, oligopolistic firms may find it optimal to keep their prices elevated and not return to the pre-shock equilibrium. If both firms continue to charge price $P_1$ even though their costs have returned to the old level, their profits are $\Pi_2 = P_1 Y_2 - C(Y_2) > \Pi_0$, where the inequality holds as long as the quantity restriction is not too strong (technically, if the output level is sufficiently close to the monopoly level).

Following an "implicit collusion" strategy of keeping prices elevated is an equilibrium of the repeated pricing game between two firms as long as they are sufficiently patient, according to the Folk theorem. In this game, each firm's strategy is to charge $P_1$ as long as the other firm also does so, and to revert to $P_0$ forever if the other firm deviates from $P_1$. This implicit collusion strategy is the dominant strategy if the present discounted value (PDV) of following it is greater than the PDV of deviating from it, $\text{PDV}_{Collude} = \frac{\Pi_2}{1-\delta} > \Pi_0^* + \frac{\delta \Pi_0}{1-\delta} = \text{PDV}_{Deviate}$, where $\delta$ is firms' discount rate and $\Pi_0^*$ is the extra profit that the firm could obtain for one period by deviating and undercutting its competitor—who charges the implicit collusion price $P_1$—for one period and then reverting to the pre-shock Cournot equilibrium with equilibrium profits $\Pi_0$.

Under implicit collusion, the markup charged by the oligopolistic firms is greater than under either of the two allocations before. Employment is lower than in the supply bottleneck equilibrium as output is still restricted but the level of $K$ is higher than under the bottlenecks. The economy thus experiences rising prices, falling real wages, and falling employment—the stagflation originally triggered by supply bottlenecks is perpetuated.

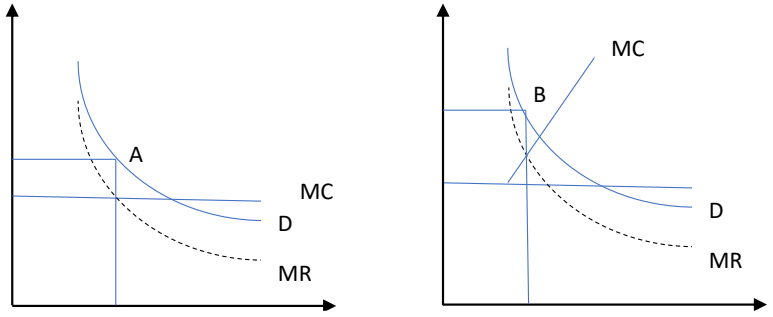


Figure 2: Supply bottlenecks and stagflation

The reasons why such inefficient supply bottlenecks could arise the first place include several market imperfections that collectively gave rise to underinvestment in resilience and spare capacity. [10] As a result, government interventions to enhance such investments are desirable both ex ante and ex post.

The government's role of providing funding and demand guarantees to the developers of coronavirus vaccines is a vibrant example of how government can successfully mitigate the consequences of incomplete risk markets, agency problems, and the associated macroeconomic externalities—without government assistance, such vaccines may have been delayed by years. Many governments around the world used the power of the state to intervene in markets to ensure an adequate supply of COVID-19 related protective equipment, internalizing both public health externalities and the associated macroeconomic externalities. Similarly, the Defense Production Act—which allows the U.S. President to direct private companies to prioritize orders from the federal government—reflects the perspective that markets may at times not fully reflect social values.

At present, there are imperfections in risk markets that may be holding back U.S.-based oil and gas producers from expanding production. With fracking, production could be brought online fairly quickly, and could be taken offline in a few years if it is no longer desirable to continue to produce, so expanding production now would have only a limited effect on climate change. However, based on their experience after previous spikes in crude oil and gas prices, they are concerned that investing in expanded production may generate losses if crude oil prices decline—and they cannot fully insure against such declines, given that there do not exist well-developed risk markets that extend sufficiently far into the future. Just like the U.S. government maintains a Strategic Petroleum Reserve that has recently been tapped to moderate the oil price hike that followed Russia's invasion of Ukraine, there are macroeconomic benefits to the U.S. having additional oil capacity on retainer in the short to medium term—despite the massive environmental externalities from fossil fuel consumption that make it desirable to phase out oil in the long term. In short, there are several government policies that can partially substitute for the missing risk markets and alleviate today's inflationary pressures; these measures are socially profitable even though they may not be privately profitable, precisely because of the macroeconomic externalities. [11] Among these policies are short-term price guarantees; in fact, when prices go down in the future, producers can be paid to keep the oil or gas in the ground.

### *3.2.3. Market Power and Inflation Dynamics*

Another factor that may play a role in exacerbating inflationary pressures is the increase in industry concentration and the associated rise in market power. Although this is a phenomenon that has played out slowly over the past two decades, as documented, e.g., by Thomas Philippon, the pandemic and the

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10. These market imperfections include incomplete contracts—e.g., uncontingent long-term contracts—and incomplete risk markets; it would have been impossible for automakers to specify all eventualities in their contracts with chipmakers, and to agree in advance how to adjust the prices and quantities of chips delivered as a function of the specific circumstances that materialized, e.g., how chip deliveries should respond to a pandemic. Moreover, they also include insufficient provisions related to the breach of contracts if suppliers cannot meet their promised deliveries. Furthermore, they are exacerbated by agency problems—managers have incentives to focus excessively on the short term and forego risk-mitigating investments, e.g., adopting just-in-time production processes that cut out slack that would be useful in unforeseen circumstances, or becoming dependent on a single energy supplier that is politically unreliable, as much of Europe did, with severe macroeconomic consequences when disruptions arise. Finally, they are also exacerbated by collective moral hazard problems—the notion that government will help and provide bailouts in case a large aggregate shock such as a pandemic hits the economy.

11. This may not be the only reason, however, that the market does not provide the desired risk mitigation—several of the points listed in the previous footnote also apply here.

associated supply disruptions may have played a role in facilitating oligopolistic coordination in increasing markups and weakening competitive forces that counteract the tendency.

An important compounding factor may have been the following: in the aftermath of the pandemic, supply disruptions made it more difficult to invest in additional capacity. Firms in monopolistic competition find it optimal to raise their markups and their prices when they sense that the supply elasticity of their competitors is reduced by these factors. Moreover, in normal times, firms that gain higher market power find it optimal to reduce quantities and increase prices slowly because many of their investments are irreversible and their capacity depreciates slowly. However, the pandemic may have accelerated the depreciation of their productive capacity, especially with the departure of skilled labor and, as noted, the difficulties of replacing and maintaining capital.

Once markups have risen, and after temporary shocks have subsided, greater market concentration may make it easier for oligopolistic firms to sustain an equilibrium of implicit collusion, supported by a version of the Folk theorem for repeated games: no firm has an incentive to reduce prices as long as its competitors do not reduce prices, since it knows that a price war would only end up hurting both of them—with the beneficiaries being consumers. A similar dynamic may explain the persistence of high oil prices. We lay out a simple model that describes these forces analytically in the second part of Box 2 on implicit collusion. The box describes an oligopolistic industry that first raised prices because of supply shortages, but the price hike served as a coordinating mechanism to achieve implicit collusion and not lower prices once the shortages had subsided.[12] In all the described instances, the behavior of individually rational actors imposes an externality on the macroeconomy.

Similar phenomena may give rise to macroeconomic externalities in the labor market. Employers are currently not increasing wages sufficiently to keep pace with inflation, leading to reductions in real wages. The reasons for these sluggish wage responses include efficiency wages—e.g., because of imperfect information, it may not pay off for a given firm to raise its wages commensurately with prices if it believes (in this case, correctly) that others will not be doing so.[13]

Pricing dynamics provide another arena in which simple textbook models may be misleading. New Keynesian models typically build on Dixit-Stiglitz preferences, which exhibit a technical property called constant elasticity of substitution. As a result, the pricing strategy of firms in these models is always the same: they charge markups that are in expectation a constant fraction of their costs, no matter if the economy is in normal times or if it experienced a pandemic or an oil price shock. However, as we observed before, in a general equilibrium model that does not make such simplifying assumptions and that better accounts for reality, the pricing strategies of firms are influenced by the economic environment more broadly, including by intertemporal considerations.

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12. The supply shock helps the two oligopolists coordinate, in a way that would (at least under current antitrust laws) have been otherwise difficult. To be sure, the oligopolists would have been even better off if they had been able to coordinate on the monopoly equilibrium—but in practice, such coordination is particularly difficult with firm heterogeneity.

13. Part of the sluggish wage growth over the past two years is explained by workers receiving greater amenity value from their work because of the availability of remote work.

**Box 3: Effects of monetary policy on pricing under customer relationships**

Consider a two-period economy $t = 1,2$ with a representative consumer in which labor is the numeraire so the wage $w = 1$ and the gross interest rate $R$ is set by a central bank. A representative firm forms customer relationships and transforms labor into output at a rate of one-for-one. In the spirit of Phelps and Winter, and similar to the setup of Greenwald and Stiglitz (2003), the firm has an initial customer stock $n_1 = 1$ that evolves as a function of the price $p_1$ charged by the firm itself as well as the average price charged by all other firms $\bar{p}_1$ so that $n_2 = f(p_1, \bar{p}_1)$. The function $f(\cdot,\cdot)$ is decreasing and concave in its first argument, capturing decreasing returns to efforts to lure customers. In a symmetric equilibrium, the price of each firm equals the average price and the representative firm's customer stock equals unity, but individual firms do not internalize this relationship.

In every period $t$, each of the $n_t$ customers of the firm demands $d(p_t)$ units of output from the firm, which is declining in the price, giving rise to a period profit $\pi_t = n_t(p_t - 1)\, d(p_t)$. In the final period $t = 2$, the firm simply chooses the monopoly price $p^*$ that statically maximizes $\pi_2$ and earns $v^* = (p^* - 1)\, d(p^*)$ units of profit per customer. However, in period $t = 1$, the firm maximizes its discounted future profits, taking into account how its current choice of price $p_1$ will dynamically affect its future customer stock $n_2$ and solving $\max_{p_1} \pi_1 + \pi_2/R$. The resulting optimality condition is

$$d(p_1) + (p_1 - 1)d'(p_1) = -f_1(\cdot)\, v^*/R$$

This condition captures that the firm trades off the static marginal revenue from raising its price with the discounted marginal gain in future profits from expanding its customer stock. It is then easy to see the following result:

**Proposition 1** An increase in the interest rate $R$ induces the firm to place a lower weight on its future customer stock and increase the price $p_1$.

The finding is also illustrated in the figure below, which shows equilibrium as the intersection of the marginal revenue curve MR (left-hand side of the optimality condition) and the negative of the marginal future profit curve MFP, which shifts down when the interest rate rises. (The intersection of the two curves at the left side of the figure is not an equilibrium since the firm can raise profits further by increasing the price $p_1$.)

Another noteworthy feature of the model is how uncertainty affects the firm's pricing decisions. If there is a mean-preserving shock to consumer demand $d(p_2)$ in period 2, Jensen's inequality implies that the expected profit of an additional customer $v^*$ declines, making it optimal for the firm to value its short-term profits relatively more than its customer stock, with direct implications for its pricing strategy:

**Proposition 2** A mean-preserving shock to consumer demand $d(p_2)$ in period 2 induces the firm to raise its price $p_1$.

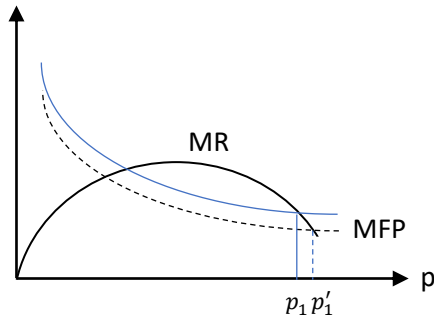


Figure 3: Effects of higher interest rates on pricing in customer relationship model

In Box 3, we lay out a simple model in the spirit of Phelps and Winter, who described an economy in which firms have to trade off the potential gain today from raising prices against the risk of losing customers and the value of profits foregone in the future. In the model, an increase in interest rates leads firms to discount future profits more highly and raise prices today, as captured by Proposition 1. Moreover, greater uncertainty may reduce the weight that firms place on retaining customers by keeping prices low even further, generating additional inflation, as captured in Proposition 2. Although these effects reflect only one of several forces that determine firms' pricing strategies, and many effects go in the opposite direction, they point out that the effects of monetary policy on inflation can be varied. Similar

forces apply in labor markets characterized by search and quits: when interest rates rise, they provide an incentive for firms to lower real wages, or not to have wages keep up with prices when there is inflation. In all of these cases, the implication for the aggregate economy is a macroeconomic externality: suppressed wages lead to suppressed labor supply, suppressed output, and excessive price pressures.

### 3.3. Political Economy Challenges of the Fiscal-Monetary Policy Mix

One challenge to using fiscal policy to address macroeconomic externalities comes from a political economy problem: policymakers are frequently concerned that temporary fiscal spending programs will become permanent; for example, because they create a constituency that will lobby for them. As a result, programs that were originally enacted for macroeconomic stabilization reasons—which are by their very nature intended to be short-term—could permanently increase spending in an inefficient and wasteful manner. Conversely, however, attempts to avoid the described political economy dynamics may lead to insufficient spending on socially useful temporary policies. Moreover, concerns that temporary cuts will become permanent reductions in fiscal spending give rise to insufficient willingness to postpone or reduce fiscal spending in periods of overheating—even if this may be beneficial for the macroeconomy.

At present, even though it would be desirable to reallocate some fiscal spending to relax supply constraints in specific sectors to reduce overall inflationary pressures, this is made more difficult by the described political economy challenges. Likewise, there would be significant macroeconomic benefits to a temporary tax cut on gas—with a provision that the tax will be automatically reinstated, and the temporary revenue shortfall undone, once crude oil prices decline sufficiently. Such provisions require trust that the future commitments will be honored. Still, it would be useful to have legislation that explicitly makes interventions contingent on the state of the world, with a provision that undoing the commitments would only be possible via legislative action, which imposes political hurdles. As an example, it might be desirable for the gas tax to be set to stabilize gas prices (increasing gradually over time to reflect general inflation and the desire to curb gas consumption because of climate change), with the gas tax thus serving two functions, collecting revenues and stabilizing prices. The government is in a better position to absorb risk than are low-income individuals.

There are also political economy challenges for monetary policy. The distinction between fiscal and monetary policy in general—and when it comes to addressing macroeconomic externalities in particular—is less clear than it seems at first sight. For example, if intertemporal substitution effects are indeed central to the transmission of monetary policy, then unconventional fiscal policies consisting of a path of increasing of consumption taxes and decreasing labor taxes, together with investment tax credits and tax cuts on capital income, can achieve the same results. Moreover, many monetary policy actions, such as purchasing mortgage bonds or government bonds in the peripheral eurozone, also contain fiscal elements by steering the allocation of credit.

Given an appropriate legal framework, monetary authorities could exert significant positive effects on credit allocations when there are macroeconomic externalities. This is certainly true for the liquidity interventions that central banks routinely conduct during financial crises—and that mitigate what would otherwise be enormous macroeconomic externalities. Monetary policy could further expand this role by providing differential access to funds or differential interest rates. Many governments implicitly or explicitly do this, e.g., in assigning risk weights or mandating credit allocations such as those associated with the Community Reinvestment Act. Policies where risk weights do not fully accord with social risks are *de facto* implicit subsidies; this is the case, for instance, of current practices in the U.S. which do not fully account for climate risk, almost surely providing an implicit subsidy for fossil fuels and real estate investments in more climate-affected areas. Still, many central bankers are skeptical of the approach,

especially were it to be more explicit and less hidden than the current subsidies. In particular, as a quasi-fiscal action, an expansion in the role of monetary policymakers would have to go hand-in-hand with greater political accountability for central bankers and greater representativeness of central bank boards.[14]

### 3.4. International Dimensions

Given that the U.S. dollar is the anchor of the international monetary system, the U.S. policy mix between fiscal and monetary policy also has global ramifications. The international spillover effects of fiscal and monetary policy differ significantly. As the U.S. raises interest rates, it generates negative spillovers for many other countries by increasing their borrowing costs and by strengthening the dollar—while doing little to curtail the global prices of oil and food. In doing so, the increase in U.S. interest rates stokes inflation in other countries, whose currencies have depreciated.

By contrast, fiscal measures that untangle the supply side of the economy would generate positive international spillovers by reducing inflationary pressures worldwide and curtailing the need for interest rate hikes. This creates the risk that the U.S. may put too much emphasis on monetary policy from the perspective of the international monetary system, with potential adverse spillbacks on the U.S. economy.

## 4. Conclusions

The global economy is facing macroeconomic imbalances and inflation that are less transitory than was hoped a year ago. While economists continue to debate the relative importance of the factors contributing to it, the more immediate question is how to respond—and what kind of models are likely to be most useful in structuring the best response. This paper suggests that the old role assignment between fiscal and monetary policy based on the canonical consensus on macroeconomic stabilization needs to be revised— the role of fiscal policy has already grown significantly over the past 15 years, but frequently in a haphazard manner. We argue that fiscal policy should be assigned a greater role in a more systematic fashion. In tandem, since an important element in current inflation is supply side problems in specific sectors, macroeconomic models need to analyze these effects at a sufficient level of disaggregation to be useful for policymakers.

Market failures and the associated macroeconomic externalities are a critical factor underlying the current macroeconomic dislocations, and both fiscal and monetary policy should therefore be sensitive to these market failures. Well-crafted and targeted fiscal policies can be an important part of the policy response to aggregate demand imbalances. In particular, in the present environment, fiscal policies should be directed at relieving labor market shortages, supply constraints, and the adverse distributional effects of inflation and the possible attendant economic slowdown. As we noted above, even if excess demand is judged to be an important contributor to inflationary pressures, a well-tailored fiscal policy response—modestly increasing taxes on high-earners and delaying non-urgent fiscal expenditures—is likely to be better than relying exclusively on monetary policy, which is blunt, risks curtailing investments that might actually alleviate the supply shortages and has other undesirable side effects.

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14. The standard argument for independence focuses on the importance of commitment, but recent macroeconomic events have highlighted the importance of flexibility in the face of deep uncertainty. A further concern is that it would require efforts to forestall arbitrage between sectors with differential access to funds. But even with such arbitrage, there may be benefits from at least some differentiation.

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