The New Supply-Side Era: The O-Ring Meets Geopolitics

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Section I: We're All Geopolitical Supply Siders Now

For most of the postwar era, economists' default explanation for output and inflation fluctuations was aggregate demand: variation in household consumption, business investment, the fiscal impulse, and the inventory cycle. As supply chains extended across the world and China's role within them increased, the ease of substituting one source of supply for another made managing demand the central challenge for policymakers. The supply side of the economy seemed to recede as a source of higher-frequency macroeconomic risk. The steady, low-variance, and largely predictable expansion of productive capacity absorbed shocks; if one source for a good grew expensive or unreliable, an alternative was just a container ship away.

Today, we need to update this framework and recognize the predominant role of the supply side in macroeconomic fluctuations as well as many associated puzzles in global economics. The pandemic, artificial intelligence, Russia's invasion of Ukraine, tariff shocks, China's rare-earth export controls, and the war in the Middle East have delivered the same lesson six times in six years: supply shocks are now a dominant source of macroeconomic variance.

The change is especially clear through the lens of global investors. Financial markets care about surprises: when does an economic outcome differ from the consensus expectation discounted into markets? Historically, aggregate supply rarely surprised market participants, but aggregate demand often did. Today, that picture is flipped. For markets as well as business leaders, economists, and policymakers, it is a new supply-side era.

This is not the rise of a 1980s-style supply-side economics, however. The crucial factors today, for example, are not marginal tax rates and their effect on incentives to work and invest. Today's supply story is instead more about shocks that emerge from beyond a narrow economic frame: from geopolitics, concentrated chokepoints, the productivity shock of AI, and the physical and network dependencies that a generation of globalization built and that a new era of great-power competition is exposing.

In 1993, the economist Michael Kremer built a theory named for the tragic destruction of the space shuttle *Challenger*, which occurred because a single component—a rubber O-ring seal—failed in the cold. He recognized that many production processes are chains of tasks in which output is the product, not the sum, of the quality at each stage. One weak link can reduce or destroy the value

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of everything else. That multiplicative structure is what makes today's economy so exposed to supply shocks: as products became more complex, a generation of globalization built long supply chains, and a problematic input at one stage—a chip, a mineral, a precursor chemical—can shut down production far beyond it.

These supply shocks behave quite differently from the textbook demand cycle. Their effects develop slowly, propagate through supply chains in waves—delivery delays, then input shortages, then margin compression, then price pass-through—and unwind with long and uneven lags.

The role of the supply side in macroeconomic variations has been growing even though the economic impact from any *given* supply shock may be smaller than in the past. Oil prices and the economy reacted far less to the recent closure of the Strait of Hormuz than to the embargoes of the 1970s, for example.[2] What distinguishes the new era is thus not necessarily the blast radius of any single shock, but instead their frequency and overlap. Disruptions (especially in energy) may tend to have smaller effects than those of their historical counterparts, but they arrive more often and, increasingly, on top of one another.

New shocks, like the COVID-19 pandemic, may manifest somewhat more in prices than in real economic activity because of massive fiscal and monetary response cushioning demand. Without that demand support, the hit to real output would be larger. That underscores a related point: while this O-ring variant of the supply side has gained importance, the role of aggregate demand has faded somewhat for the simple reason that policymakers have increasingly stepped in to fill in any incipient demand shortage. Markets now expect that when demand wavers, authorities will respond—that central banks stand ready to cut rates, expand balance sheets, and backstop asset prices, supplemented when needed by aggressive fiscal support. The implicit policy puts have attenuated demand shocks, muting their variance and shortening their half-life, leaving the supply side as the main source of persistent and genuinely surprising disturbances. In addition, the AI infrastructure buildout has been providing a cushion to demand recently; we discuss AI further below.

In sum, supply matters more today because it is less elastic than in the previous era of hyper-globalization, because it is prone to more frequent shocks from geopolitical and other disruptions, and because demand shocks have been cushioned (including through policies that do not appear to be sustainable over time). This calls for a new framework, one in which supply shocks originate in politics as well as technology. For policymakers and businesses alike, the stakes here are practical, not academic. We call the resulting discipline "contextual alpha": incorporating geopolitical and regulatory factors more directly in business and economic analysis.

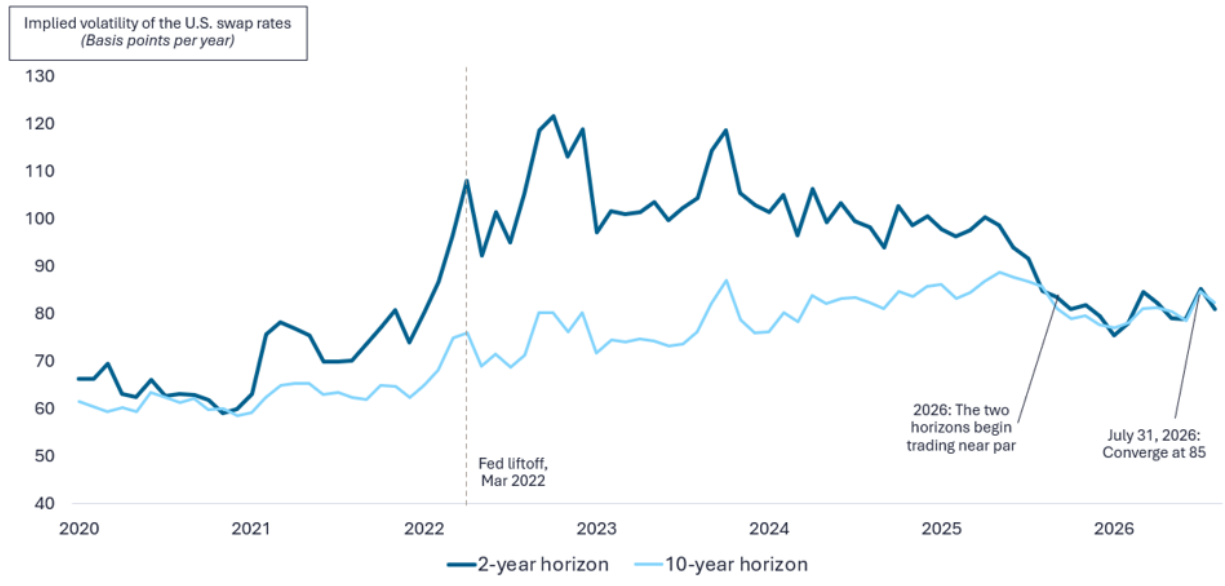
[2] Jason Bordoff and Meghan O'Sullivan, "The Long Shadow of the Iran Shock," *Foreign Affairs,* August 2026. Bordoff and O'Sullivan warn, however, that more substantial effects may ensue if the Strait of Hormuz remains mostly or entirely closed in the future (because oil and gas inventories have now been largely depleted, among other reasons).

Section II: Observing the New Supply-Side Era in Market Prices and Economic Forecasts

One place to observe the new supply-side era is in the term structure of uncertainty itself. Global investors are paying more to insure themselves against long-term risk relative to short-term risk. Short-term economic outcomes have traditionally been driven principally by demand fluctuations, while long-term outcomes are most often driven mostly by supply. Thus, an increased market focus on the longer term is itself suggestive that something other than the demand cycle has become a bigger source of uncertainty for investors. And that pattern is precisely what we observe.

We consider two measures from financial markets. First, we observe the expected volatility around interest rates at various time horizons, as implied from the market for options on interest rate swaps. The expected volatility measures how wide investors expect the range of outcomes to be for rates at a given horizon—a proxy for the market's uncertainty around those rates. Figure 1 plots the implied uncertainty around the U.S. swap rate at two future horizons: two years out and ten years out. Through the post-COVID hiking cycle, the near horizon carried far more implied volatility, as it traditionally has done. But since the hiking cycle stopped, AI enthusiasm manifested, and geopolitical shocks became more prominent, near-horizon uncertainty has retraced most of its surge, while uncertainty about rates a decade out has held near record highs. By 2026, the two horizons trade at par, and at times the decade-ahead horizon carries more: investors are paying less to insure themselves against near-term risks and more to insure themselves against long-term risks. Markets have repriced the risk of the distant future.

Figure 1. Markets are now as uncertain about interest rates a decade ahead as about the next two years—near-term demand uncertainty has retraced most of its surge, while the long horizon uncertainty holds near record highs.

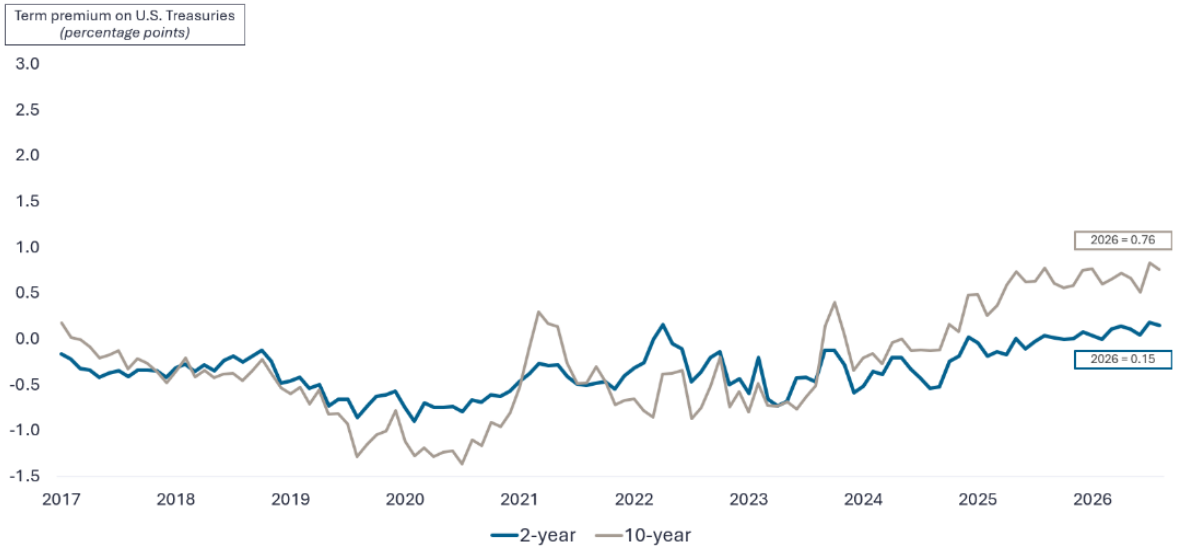


Volatilities are annualized (per annum). Cumulative uncertainty mechanically widens with horizon (scaling with the square root of time), so the relevant comparison is per annum: annualized volatility normally declines with option expiry because rates mean-revert. Parity between the 2-year and 10-year

expiries therefore implies the market is applying little or no mean-reversion discount to the long horizon; pricing shocks as near-permanent. Normal (basis-point) implied volatility of at-the-money USD swaptions on the 10-year SOFR swap rate, at a 2-year option expiry (uncertainty about the 10-year rate two years from now) and a 10-year expiry (uncertainty about the 10-year rate a decade from now). End-of-month quotes via Bloomberg (USSN0210, USSN1010). Through the hiking cycle, the 2-year horizon carried 25-30bp more implied volatility than the 10-year. Source: Bloomberg.

A second place to observe this trend is the term premium on government bonds. The term premium is the compensation an investor demands to hold a long-term bond rather than a series of short-term bonds, and it can be taken as a proxy for uncertainty in the factors that drive interest rates over the term of the bond. Figure 2 shows the U.S. Treasury term premium at the two-year and 10-year maturities, from the Federal Reserve Bank of New York's Adrian-Crump-Moench model. Since the end of 2020, the 10-year premium has risen by roughly 1.6 percentage points, swinging from deeply negative to its highest sustained level in a decade. Investors are again charging more for exposure to the long run: to the inflation that supply shocks can reignite, to fiscal paths swollen by cushioning every demand shock, to a world in which the distant future is no longer a safe extrapolation of the recent past. Short-maturity premia, tied to the policy-buffered demand cycle, have barely moved by comparison.

Figure 2. Investors are charging more for long-horizon interest-rate risk.



The term premium is the expected extra return from holding a Treasury to a given maturity rather than rolling short-term bills—the compensation investors require for bearing interest-rate risk to that horizon—estimated with the New York Fed's Adrian-Crump-Moench (2013) five-factor no-arbitrage model; end-of-month values, 2- and 10-year maturities. From end-2020, the 10-year premium rose 1.6 percentage points (from −0.80 to +0.76 as of the end of August 2026), versus a 0.7-point rise at the 2-year. Source: Federal Reserve Bank of New York (Adrian, Crump, and Moench term premia).

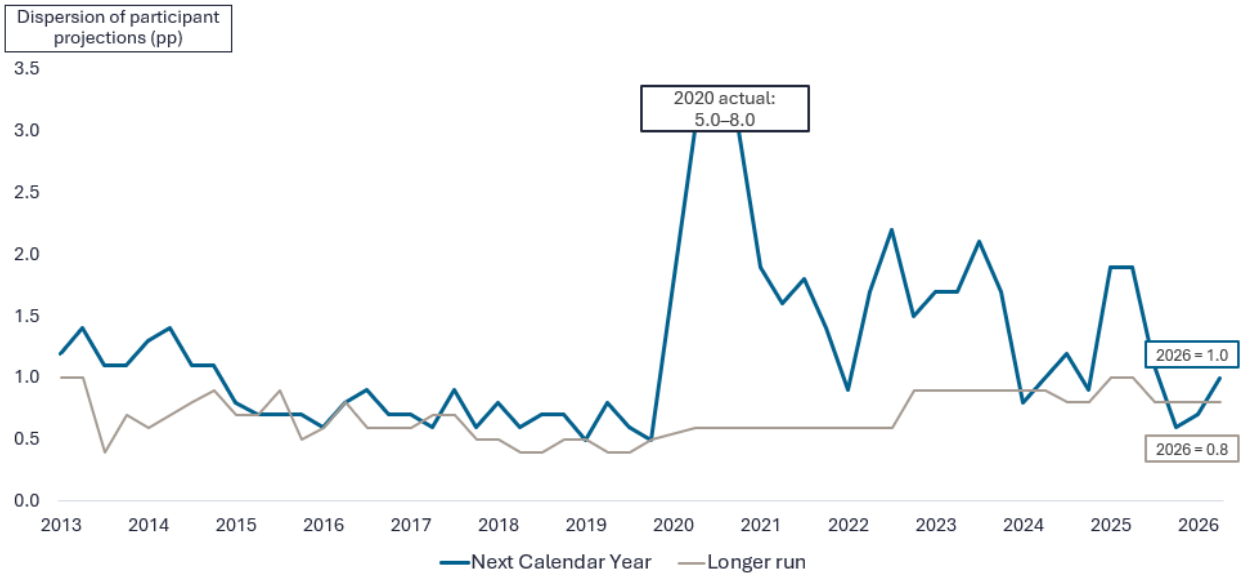
Neither of these measures, however, identifies the source of the repricing, which could be due to real rates or inflation rates. Nonetheless, it is reasonable to conclude that the long horizon has become the locus of macroeconomic uncertainty, that the demand cycle alone cannot account for this, and that supply-side forces are, at a minimum, an important part of the shift.

Outside of interest rates, the Federal Reserve's own projections show the same migration of uncertainty toward the long run. Figure 3 tracks the span of FOMC participants' projections of real GDP growth—the range from the highest to the lowest submission—for the next calendar year

and for the "longer run." Disagreement about next year exploded in 2020 and settled back toward its old normal, as demand-driven uncertainty often does. Disagreement about the economy's long-run growth rate has instead roughly doubled since 2019 and has kept widening. At several recent meetings, the committee disagreed more about the long run than about the year ahead—something that happened only rarely before 2020. AI pulls on one side while tariffs, chokepoints, and demographics pull on the other: the committee's range of views about potential has widened because potential—the supply side—is where the shocks are now landing.

For another source of indirect evidence, the Federal Reserve Bank of San Francisco argues that the recent flip of the stock-bond correlation to negative implies that the dominant source of perceived risk has shifted to supply shocks, after two decades in which perceived risk rested primarily on the demand side.[3]

Figure 3. Fed policymakers now disagree about the economy's long-run growth rate as much as about next year's—at several recent meetings, more.



Width of the full range (maximum minus minimum) of FOMC participants' projections for the change in real GDP, for the next calendar year and for the 'longer run', from each quarterly Summary of Economic Projections table. Next-year widths of 5-8pp during 2020 are clipped at 3pp for readability. The committee disagreed more about the long run than about the year ahead in 3 of 28 meetings before 2020 and at 3 of the last 10 meetings. Source: Federal Reserve Board, Summary of Economic Projections.

To be sure, long-horizon uncertainty can stem from more than supply-shock dynamics attributable to geopolitics or AI. Markets may also be pricing fiscal sustainability, concerns around central-bank independence, or uncertainty around the neutral interest rate. But even those factors reflect uncertainty around our economy's ability to produce in the long run and are in some sense essentially supply side in character. The fiscal concern grows with each supply shock because

[3] Thomas M. Mertens and Wesley Wasserburger, "Financial Markets, Oil Prices, and Supply-Side Risks," FRBSF Economic Letter 2026-21 (Federal Reserve Bank of San Francisco, August 10, 2026), https://www.frbsf.org/research-and-insights/publications/economic-letter/2026/08/financial-markets-oil-prices-and-supply-side-risks/.

governments cushion each shock and deficits accumulate. The credibility concern grows the same way, as each shock forces central banks to act or stay put while under pressure from political leaders. The AI story is fundamentally a supply story—it works through potential growth. And when FOMC participants disagree more about long-run growth than about next year, that disagreement is about potential.

Section III: From an Era of Elastic Supply to One of Accommodating Demand

Why is this occurring? For much of the postwar period, the supply side receded as a source of macroeconomic risk as supply constraints bound less often. As globalization made the supply curve far more elastic, demand came to drive a larger share of the fluctuations that remained. Over time, however, macroeconomic policy innovations came to mute the importance of demand, and geopolitical shocks became more dominant. The result is that the supply side has moved to the front of policymakers' and business leaders' minds, and that supply focus is apparent in the variety of financial indicators discussed above.

How Globalization Made Supply Less of a Constraint

Postwar globalization appeared to make the supply curve seem effectively irrelevant. Enabling technologies helped: the shipping container, standardized internationally between 1968 and 1970, made globe-spanning supply chains efficient, and container trade grew at high single-digit rates through the 1990s and 2000s.[4] Partly facilitated by this innovation in shipping, China's manufacturing value added rose from roughly $0.6 trillion to about $4.7 trillion between 2004 and 2024. By the end of that period, China was producing more than the next several manufacturing economies combined.[5]

The impact of this increased supply had the expected effect on prices. Amiti et al. (2020) find that U.S. imports of manufactured goods from China reduced the U.S. variety-adjusted manufacturing price index by an estimated 8.0 percent between 2000 and 2006 in the median industry, following China's 2001 WTO accession. They estimate that roughly two-thirds of the effect came from the entry of new Chinese exporters and one-third from incumbent Chinese exporters cutting prices,

[4] UNCTAD, "Developments in International Seaborne Trade," in *Review of Maritime Transport 2010* (Geneva: United Nations, 2010), ch. 1, 17, https://unctad.org/system/files/official-document/rmt2010ch1_en.pdf.

[5] World Bank, "Manufacturing, Value Added (Current US$) – China," World Development Indicators (indicator NV.IND.MANF.CD), drawing on World Bank and OECD national-accounts data, https://data.worldbank.org/indicator/NV.IND.MANF.CD?locations=CN.

cuts which were driven largely by China's own liberalization of input tariffs.[6]

Although shocks hit from time to time, particularly for oil, the high supply elasticity generated by globalization was a key driver in lowering the pressure the supply side could place on economic activity. World trade rose from roughly 40 percent of global GDP in 1990 to around 60 percent in 2008, and gross cross-border capital flows went from 3 percent of world GDP to over 20 percent in the same period.[7] [8] Chinese manufacturing was the largest single source of that trend, but North American integration under NAFTA, Southeast Asia's entry into global production networks, and deepening transatlantic and intra-European supply chains were all material contributors.[9] Relatedly, these factors also reduced inflation. Rogoff (2003) argues that globalization has led to lower inflation due to intensified competition and lowered prices.[10] Forbes (2019) carried the point forward, finding that global factors (such as commodity prices, world slack, exchange rates, and global value chains) explained an incrementally larger share of headline CPI across advanced economies after the Great Financial Crisis.[11]

So, globalization effectively increased the elasticity of supply. But what has happened more recently to globalization trends? Despite the recent increase in geopolitical volatility, globalization has not truly unwound. Rather, it has reorganized into different geopolitical blocs. In his 2025 book, *The Fractured Age,* Neil Shearing describes the effects of China's deepening economic and geopolitical rivalry with the U.S., which fractured the relationship between the two and forced other countries to pick a side.[12]

In its May 2026 Capital Research Report, Lazard's Geopolitical Advisory team found that competition between major powers is increasingly driving a regime shift in global capital flows.[13] The International Monetary Fund has also found that foreign direct investment (FDI) flows have

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[6] Mary Amiti, Mi Dai, Robert C. Feenstra, and John Romalis, "How Did China's WTO Entry Affect U.S. Prices?," *Journal of International Economics* 126 (2020): 103339, https://www.sciencedirect.com/science/article/abs/pii/S0022199620300556.

[7] World Bank, "Trade (% of GDP)," World Development Indicators (indicator NE.TRD.GNFS.ZS), https://data.worldbank.org/indicator/NE.TRD.GNFS.ZS.

[8] Neil Shearing, *The Fractured Age: How the Return of Geopolitics Will Splinter the Global Economy* (London: John Murray Business, 2025), 119.

[9] Shearing, 36-50.

[10] Kenneth Rogoff, "Globalization and Global Disinflation," in *Monetary Policy and Uncertainty: Adapting to a Changing Economy* (Kansas City: Federal Reserve Bank of Kansas City, 2003), 77–112, https://www.kansascityfed.org/Jackson%20Hole/documents/3428/pdf-Rogoff2003.pdf.

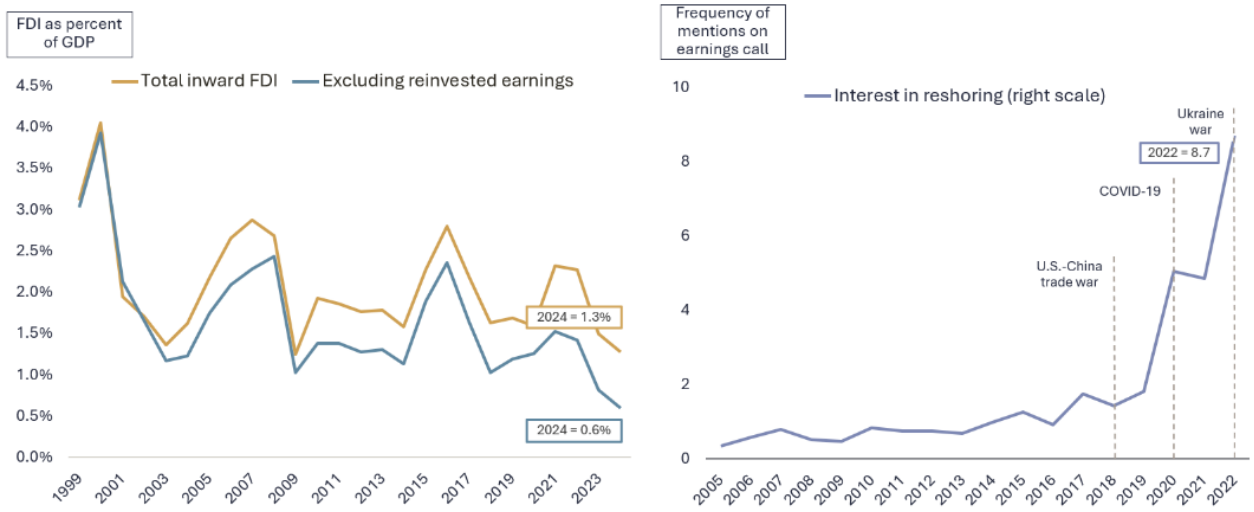
[11] Kristin J. Forbes, "Inflation Dynamics: Dead, Dormant, or Determined Abroad?," *Brookings Papers on Economic Activity* (Fall 2019): 257–338, https://www.brookings.edu/articles/inflation-dynamics-dead-dormant-or-determined-abroad/.

[12] Shearing, 9.

[13] Lazard Geopolitical Advisory, "Political Capital: How Geopolitics Is Reshaping Cross-Border Investment and M&A Flows" (Lazard, May 2026). See also: Gopinath (2024); Aiyar et al. (2023); Airaudo, de Soyres, et al. (2025); Antràs (2021); Baldwin (2022).

become increasingly concentrated among geopolitically aligned countries, particularly in strategic sectors, with strategic-sector investment into Asia falling from 2019 and recovering only mildly through late 2022.[14] Figure 4 shows how FDI has evolved, while Figure 5 shows how interest in reshoring has surged recently through the U.S.-China trade war, COVID-19, and Russia's invasion of Ukraine.

Figures 4 and 5. FDI has declined post-2008 while mentions of interest in reshoring have since surged.



FDI as a percent of world GDP: FDI has fallen as a percent of global GDP from the 2000s to 2025—the core of post-crisis "slowbalization" (Antràs 2021; Baldwin 2022). Inward direct investment, net incurrence of liabilities, BPM6. Components: equity other than reinvestment of earnings + debt instruments (= FDI excluding reinvested earnings) and reinvestment of earnings. Balanced panel of 57 economies reporting all three components every year 1999-2025, excluding conduit and offshore financial centers (Netherlands, Luxembourg, Ireland, Switzerland, Belgium, Hong Kong SAR, Singapore, Panama, Caribbean centers). China, Indonesia, Vietnam, and South Africa are excluded because they do not report the reinvested-earnings split in IMF BOP data. 2025 data represents the first annual vintage and is still subject to revisions and excludes 12 small countries where preliminary data was not available for 2025 at the time of publication. Alongside reshoring interest measured as mentions of "reshoring," "friend-shoring," or "near-shoring" in earnings calls—stepping up through the U.S.-China trade war, COVID, and Russia's invasion of Ukraine. No additional years are tracked as the study concluded in 2022. Sources: IMF balance of payments statistics, NL Analytics.

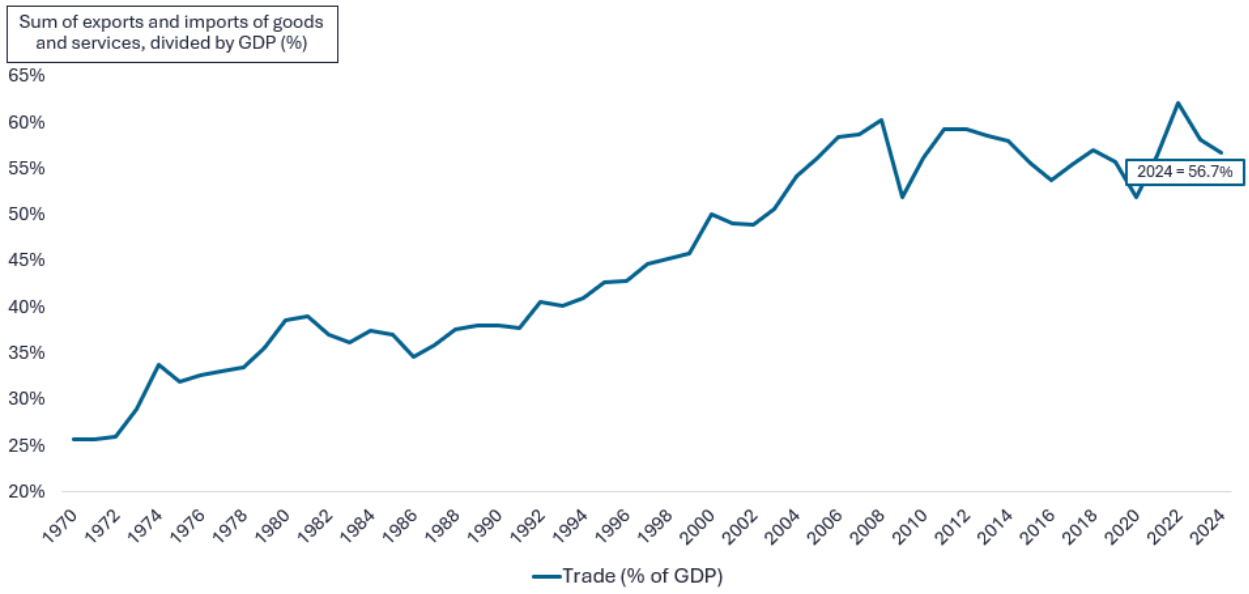
The same reorganization is visible in goods trade. Alfaro and Chor (2023; 2025) document a "Great Reallocation" in U.S. supply chains from China toward Vietnam, Mexico, and Taiwan. The reallocation they projected arrived in waves: through 2020, the shift was concentrated in goods that could be resourced at short notice; by 2021–2024, the shift away from China had spread even to contract-intensive, relationship-sticky goods; and between March and August 2025, following the April 2 tariff announcements, China's share of U.S. imports fell another five percentage points, leaving U.S. sourcing from China roughly back to where it stood at China's WTO accession.[15]

[14] International Monetary Fund, "Geoeconomic Fragmentation and Foreign Direct Investment," in *World Economic Outlook, April 2023: A Rocky Recovery* (Washington: International Monetary Fund, April 2023), ch. 4, https://www.elibrary.imf.org/display/book/9798400224119/CH004.xml.

[15] Laura Alfaro and Davin Chor, "Global Supply Chains: The Looming 'Great Reallocation'," Jackson Hole Economic Policy Symposium (Federal Reserve Bank of Kansas City), NBER Working Paper 31661 (August 2023), https://www.nber.org/papers/w31661; Laura Alfaro and Davin Chor, "An Anatomy of the Great Reallocation in US

The aggregate measures have flattened on both the goods and the capital sides. World trade has oscillated between roughly 52 percent and 62 percent since 2008 (see Figure 6). Lane and Milesi-Ferretti (2018) find that the growth of cross-border asset and liability positions relative to world GDP came to a halt after the financial crisis; that plateau has since persisted, even as greenfield FDI has become increasingly concentrated within geopolitical blocs, particularly in strategic sectors.[16]

Figure 6. Globalization's long climb ended in 2008: world trade has moved sideways relative to GDP for a decade and a half.



Sum of exports and imports of goods and services, divided by gross domestic product, expressed as a percentage. This is also known as the "trade openness index." 2025 data not included as the data is still preliminary and excludes most major economies. Source: National statistical organizations and central banks, OECD national accounts, and World Bank (1970-2024).

As will be discussed further below, this reshuffling changes the nature of supply curves globally. In a world organized into blocs, a supplier who is an ally today can become an adversary tomorrow by turning a routine commercial dependency into a strategic chokepoint overnight. The effective elasticity of the supply curve has decreased.

Cushioning Demand: More Interventionist Policy

While supply elasticity has declined, policy interventions have increasingly muted demand fluctuations. In her 2022 Jackson Hole address, "Monetary Policy and the Great Volatility,"

Supply Chain Trade," NBER Working Paper 34490 (2025; revised April 2026), https://www.nber.org/papers/w34490.

[16] Philip R. Lane and Gian Maria Milesi-Ferretti, "The External Wealth of Nations Revisited: International Financial Integration in the Aftermath of the Global Financial Crisis," *IMF Economic Review* 66, no. 1 (2018): 189–222; See also Chari, Converse, Mehl, Maria Milesi-Ferretti, and Vansteenkiste, Geopolitical Tensions and International Financial Fragmentation: Evidence and Implications, *Geneva Reports on the World Economy* 28 (London: CEPR Press and ICMB, October 2025), ch. 1.

Schnabel (2022) revisited The Great Moderation (Bernanke, 2004)[17] on post-pandemic evidence: from the mid-1980s, the volatility of both output and inflation declined and expansions lengthened, with broad agreement that better monetary policy was an important factor.[18] Blanchard and Simon (2001) documented the magnitude: the standard deviation of quarterly U.S. output growth fell by roughly a factor of three over the postwar period, a decline they traced to reduced volatility in the demand components of output.[19]

In addition to monetary policy, fiscal policy has acted more aggressively to cushion demand shortfalls, at the cost of rising public debt burdens globally. Particularly following the Great Financial Crisis, faster and larger discretionary responses compressed the distribution of demand shocks. The contrast in fiscal policy between the two most severe recent downturns is instructive. The response to the 2008 financial crisis, although substantial by the standards of its day, was enacted gradually: the American Recovery and Reinvestment Act of 2009 carried a headline cost of roughly $840 billion, and total federal fiscal support across 2008–2012 came to about $1.8 trillion.[20] The pandemic response was of a radically different order of magnitude and speed. The U.S. enacted more than $5 trillion across five major laws in about a year—including the $2.0 trillion CARES Act enacted in a matter of weeks, an $868 billion package in December 2020, and the $1.9 trillion American Rescue Plan in March 2021—with roughly $4 trillion out the door by the end of 2021. The pandemic response pattern was global: the IMF estimated worldwide fiscal support at nearly $16 trillion by April 2021, deployed far faster than the more protracted response a decade earlier.[21]

In the U.S. and most other advanced economies, governments have moved beyond episodic fiscal intervention during periods of crisis to providing sustained demand support, increasingly financed through rising public debt. The IMF projects global public debt, having reached about 94 percent

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[17] Ben S. Bernanke, "The Great Moderation" (remarks at the meetings of the Eastern Economic Association, Washington, DC, February 20, 2004), https://www.federalreserve.gov/boarddocs/speeches/2004/20040220/.

[18] Isabel Schnabel, "Monetary Policy and the Great Volatility" (speech, Jackson Hole Economic Policy Symposium, Federal Reserve Bank of Kansas City, Jackson Hole, WY, August 27, 2022), https://www.bis.org/review/r220830a.htm; See also Richard Clarida, Jordi Galí, and Mark Gertler, "Monetary Policy Rules and Macroeconomic Stability: Evidence and Some Theory," *Quarterly Journal of Economics* 115, no. 1 (2000): 147–80, https://www.jstor.org/stable/2586937.

[19] Olivier Blanchard and John Simon, "The Long and Large Decline in U.S. Output Volatility," *Brookings Papers on Economic Activity*, no. 1 (2001): 135–74, https://www.brookings.edu/articles/the-long-and-large-decline-in-u-s-output-volatility/.

[20] Congressional Budget Office, "Estimated Impact of the American Recovery and Reinvestment Act on Employment and Economic Output in 2014" (February 2015) (estimating ARRA's FY2009–2019 budgetary impact at nearly $840 billion); Committee for a Responsible Federal Budget, "How Does COVID Relief Compare to Great Recession Stimulus?" (June 30, 2020) (estimating that the federal government enacted roughly $1.8 trillion in fiscal stimulus and other economic support between 2008 and 2012).

[21] International Monetary Fund, "A Fair Shot," *April 2021 Fiscal Monitor*, https://www.imf.org/-/media/Files/Publications/fiscal-monitor/2021/April/English/text.ashx.

of GDP in 2025, will cross 100 percent by 2029, with no stabilization in sight on current policy.[22] In the U.S., Auerbach and Gale (2026) estimate federal debt rising from 99 percent of GDP today toward 175 percent by 2056 under current law—and 211 percent if the 2025 tax provisions are extended.[23] Unstable geopolitics will continue to contribute to government debt as public spending needs increase globally in an effort to respond to and preempt volatility. This will likely contribute to risk premia and debt issuance costs increasing over time, as illustrated in Section II. In other words, the fiscal cushion for aggregate demand has a cost, and whether it can be maintained indefinitely is a thorny but unanswered question.

These dynamics, particularly before the COVID-19 pandemic, sparked a debate over secular stagnation. When Lawrence Summers revived Alvin Hansen's phrase in 2013 following the Great Financial Crisis, the symptoms he described—chronically deficient demand, equilibrium real rates pinned near zero, inflation passive regardless of stimulus—were the demand-side face of the supply conditions described in this section.[24] A supply curve made nearly flat by globalization meant that demand shortfalls surfaced as lost output rather than disinflation, and demand expansions as output rather than inflation; and the same integration that made goods abundant contributed to a savings glut that depressed equilibrium rates. The policy corollaries—run the economy hot; treat deficits as entirely or nearly costless with r<g (that is, the interest rate below the growth rate)—were sound conditional on that regime. The repricing in Figure 2 suggests the bond market is potentially adjusting to a new regime.

The Shifting Mix: The Rise of the Supply Side

The net result is that, as policy has compressed the variance of demand shocks and as the elastic supply that globalization once provided has eroded, the volatility of output and prices is increasingly driven by supply. It appears in inflation through tariffs, energy shocks, and disruptions to economic chokepoints. It appears in growth dynamics, where supply shortfalls can cascade and affect output and demand. It is already driving the allocation of capital, where U.S. business investment in data centers is chasing optimism around the productivity benefits of AI. And as the reorganization of global supply chains continues, furthermore, it will reshape capital allocation in new ways as investment prioritizes political safety over near-term profitability.[25]

A recent example is COVID-period inflation, where our reading of the evidence is that the pandemic-era surge was driven mostly by supply rather than overheating demand. In coauthored

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[22] International Monetary Fund, Fiscal Policy under Pressure: High Debt, Rising Risks, *Fiscal Monitor* (Washington: IMF, April 2026), https://www.imf.org/en/publications/fm/issues/2026/04/15/fiscal-monitor-april-2026.

[23] Alan J. Auerbach and William G. Gale, "An Update on the Federal Budget Outlook," (Brookings Institution, March 12, 2026), https://www.brookings.edu/articles/an-update-on-the-federal-budget-outlook/. Includes federal debt held on the Federal Reserve's balance sheet.

[24] Lawrence H. Summers, remarks at the IMF Fourteenth Annual Research Conference, "Crises: Yesterday and Today," Washington, DC, November 8, 2013, video, https://www.youtube.com/watch?v=KYpVzBbQIX0.

[25] Eric Van Nostrand, "Trump's Tariffs Are Bad for Business Investment," *New York Times*, April 15, 2025, https://www.nytimes.com/2025/04/15/opinion/trump-tariffs-business-investment.html.

work with Robin Brooks of Brookings and William Murdock of Lazard, Orszag found that the shock ran via long lags through company margins in the wake of delivery delays.[26] The sections that follow take up each of these channels: what makes this supply side analytically new, and what it implies for inflation, chokepoints, investment, and firm performance in turn.

Section IV: What's New (We Are Not in Barro's World Anymore)

To simply say the supply side is back could invite a misreading. For a generation, "supply side" has been shorthand for a specific policy program—the marginal tax cuts, deregulation, and even the empirically misguided Laffer-curve logic of the Reagan era. But the debates of the 1980s focused on elements on the supply side that are playing a much less important role today. Three things in particular have changed: following a period of globalization, the effective elasticity of supply has declined; supply disturbances have become more frequent (and their origins have shifted from the domain of "economics" to one that involves more "geopolitics," a shift which has made them more difficult to forecast from economic data alone); and fiscal and monetary policy has cushioned a larger share of demand shocks. Marginal tax rates and the regulatory posture remain conceptually relevant to the supply side, but they are not the factors explaining its renewed volatility. The factors that do explain that volatility are more geopolitical in character than conventionally economic.

The Traditional Supply Side Debate: Taxes, Technology, and Incentives

The "supply-side economics" of the 1980s was a policy movement in addition to an economic theory. Robert Mundell, as early as 1971, argued that the policy instruments should be split: monetary restraint to stop inflation and fiscal easing, or reducing tax rates, to draw more production out of the economy.[27] Arthur Laffer supplied the famous curve, and the journalist Jude Wanniski packaged the "Mundell-Laffer hypothesis" into a political program that ran through the Kemp–Roth bill and into the 1981 tax cuts.[28] A more grounded wing ran through Martin Feldstein and Lawrence Lindsey, whose empirical work traced how taxation distorted saving, investment, and labor supply—and who took pains to separate their claims from the movement's more extravagant claims, such as the claim that tax cuts would pay for themselves.[29] What united these strands was

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[26] Robin Brooks, Peter R. Orszag, and William E. Murdock III, , (Brookings Institution, August 15, 2024), https://www.brookings.edu/articles/covid-19-inflation-was-a-supply-shock/.

[27] Robert A. Mundell, "The Dollar and the Policy Mix: 1971," *Essays in International Finance* no. 85 (Princeton, NJ: International Finance Section, Princeton University, May 1971), https://ies.princeton.edu/pdf/E85.pdf.

[28] Jude Wanniski, "The Mundell-Laffer Hypothesis—A New View of the World Economy," *The Public Interest* no. 39 (1975): 31–52; and Jude Wanniski, *The Way the World Works* (New York: Basic Books, 1978).

[29] Martin Feldstein, "Supply Side Economics: Old Truths and New Claims," *American Economic Review* 76, no. 2 (1986): 26–30, https://www.nber.org/papers/w1792; See also Lawrence B. Lindsey, "Individual Taxpayer Response

the conviction that marginal tax rates, and the incentives they create to work, save, and invest, were the supply side's central levers.

Academic macroeconomics held a related but distinct conception: supply as trend, not shock. In the growth-accounting tradition Robert Solow launched, long-run growth was attributed mostly to technical change—the famous "residual"—which policy could nurture but not command.[30] Even real-business-cycle theory—the postwar school that came closest to making supply shocks the entire story of the business cycle—treated those shocks as technological. In Kydland and Prescott's framework, booms and recessions are the economy's efficient response to random variation in the pace of technological progress.[31] The canonical empirical statement came from Robert Barro. In a 1990 paper, he argued that an economy's trend growth rate is determined by the interplay of private capital and productive government services financed by distortionary taxation—so that marginal tax rates matter for growth, not just for the level of output.[32] His 1991 cross-country regressions, spanning 98 countries from 1960 to 1985, found growth positively related to initial human capital and negatively related to government consumption as a share of GDP and to market distortions.[33]

The essence of the 1980s supply side was that shocks to supply were essentially domestic, slow-moving, and technological or institutional in origin: a productivity trend, an innovation, a shift in the incentive to invest. Policy entered primarily through the tax code. Put simply, the old supply-side debates were focused on providing private capital with the incentives to produce more. Today's supply-side era is of a more macro and public character: geopolitical and technological shocks are creating new uncertainty and surprise over the global economy's capacity to produce.

The New Supply Side: Geopolitics, Networks, and Spillovers

The supply side that has reasserted itself over the past several years does not originate in tax wedges or in technological progress alone. It instead originates primarily in political economy: wars, export controls, and tariffs. The relevant variable is not the marginal tax rate on capital but the location of a chokepoint or bottleneck.

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to Tax Cuts: 1982–1984, with Implications for the Revenue Maximizing Tax Rate," *Journal of Public Economics* 33, no. 2 (1987): 173–206, https://www.nber.org/papers/w2069.

[30] Robert M. Solow, "Technical Change and the Aggregate Production Function," *Review of Economics and Statistics* 39, no. 3 (1957): 312–320, https://www.jstor.org/stable/1926047.

[31] Finn E. Kydland and Edward C. Prescott, "Time to Build and Aggregate Fluctuations," *Econometrica* 50, no. 6 (1982): 1345–1370, https://www.jstor.org/stable/1913386; See also Edward C. Prescott, "Theory Ahead of Business Cycle Measurement," *Federal Reserve Bank of Minneapolis Quarterly Review* 10, no. 4 (Fall 1986): 9–22, https://www.minneapolisfed.org/research/quarterly-review/theory-ahead-of-business-cycle-measurement.

[32] Robert J. Barro, "Government Spending in a Simple Model of Endogenous Growth," *Journal of Political Economy* 98, no. 5 (1990): S103–S125, https://www.nber.org/papers/w2588.

[33] Robert J. Barro, "Economic Growth in a Cross Section of Countries," *Quarterly Journal of Economics* 106, no. 2 (1991): 407–443, https://academic.oup.com/qje/article-abstract/106/2/407/1905452.

Two features thus distinguish this supply side from the 1980s conception: its origin and its mode of propagation. Whereas the traditional framework originates supply disturbances exclusively in technology, the new one originates them also in strategic decisions taken by states—what the political economy literature has come to call the "weaponization" of economic interdependence, in which the asymmetric structure of global networks allows a state with jurisdiction over a central node to deny access to others.[34]

As noted above, Michael Kremer's O-ring theory can help explain these dependencies. If production requires *n* stages, and production is dependent on each occurring successfully, the production function is multiplicative, and the failure of any of the *n* stages, whether for natural or political reasons, undermines the whole effort.[35] Two consequences follow. The first is that small differences in reliability compound. To draw on Kremer's model, it does not pay to pair one high-quality stage with one low-quality stage: a firm with excellent inputs everywhere else loses the most from a single weak link, so it will pay the most to avoid one. The result is that the most reliable producers work together in equilibrium, and returns to those producers rise steeply across the distribution, a point we return to in discussing the widening dispersion of firm performance. The second is that as the number of stages increases, a given process is more likely to collapse as there are more places for disruption.

Relatedly, work on production networks shows that a disturbance to one well-connected sector can cascade through the chains of firms and industries that depend on it.[36] Baqaee and Farhi (2019) explain that even a node with a tiny share of GDP can move the aggregate when shocks are large and inputs are complements.[37] Cascading effects also happen far from the source: Boehm, Flaaen, and Pandalai-Nayar (2019) tracked how U.S.-based output for Japanese affiliates mapped directly from the supply shocks to the Japanese economy after the 2011 Tōhoku earthquake.[38]

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[34] Henry Farrell and Abraham L. Newman, "Weaponized Interdependence: How Global Economic Networks Shape State Coercion," *International Security* 44, no. 1 (2019): 42–79, https://direct.mit.edu/isec/article/44/1/42/12237/Weaponized-Interdependence-How-Global-Economic.

[35] Michael Kremer, "The O-Ring Theory of Economic Development" *Quarterly Journal of Economics* 108, no. 3 (1993): 551–75.

[36] Daron Acemoglu, Vasco M. Carvalho, Asuman Ozdaglar, and Alireza Tahbaz-Salehi, "The Network Origins of Aggregate Fluctuations," *Econometrica* 80, no. 5 (2012): 1977–2016, https://onlinelibrary.wiley.com/doi/abs/10.3982/ECTA9623.

[37] Baqaee, David Rezza, and Emmanuel Farhi. "The Macroeconomic Impact of Microeconomic Shocks: Beyond Hulten's Theorem." *Econometrica* 87, no. 4 (2019): 1155–1203. https://doi.org/10.3982/ECTA15202; Baqaee and Farhi extend the foundational theorem of Hulten (1978) to capture nonlinearities. Hulten's theorem says the first-order aggregate effect of a sectoral productivity shock equals that sector's sales share, which would imply chokepoints cannot have a significant effect. They find that sales shares are only a first-order approximation that fails exactly under the conditions of a weaponized chokepoint.

[38] Boehm, Christoph E., Aaron Flaaen, and Nitya Pandalai-Nayar. "Input Linkages and the Transmission of Shocks: Firm-Level Evidence from the 2011 Tōhoku Earthquake." *Review of Economics and Statistics* 101, no. 1 (2019): 60–75. https://doi.org/10.1162/rest_a_00750.

The O-ring theory also applies directly to supply-chain disruptions, illustrating how shortages in one node transmit downstream and why the resulting macroeconomic effects arrive with a delay and unwind slowly.[39] Charles Jones (2011) built a general-equilibrium model in which complementary intermediate goods—an elasticity of substitution below one—interact through a multiplier and a weak-link effect, so that a distortion to one input is amplified through the input-output structure rather than averaged away. The amplification occurs because about half of gross output is intermediate goods that are incorporated into downstream goods.[40] Jones' work makes the departure from Barro's world of supply shocks clear: it is the elasticity of supply, not the marginal tax rate, that has become the central macroeconomic parameter.

To take one example, this logic of O-ring dependencies is manifest in semiconductors. When the COVID-19 pandemic hit, automakers canceled chip orders expecting demand to collapse; when demand instead rebounded, they found chipmakers had reallocated that capacity to more profitable customers, and the automakers went to the back of the queue. A modern vehicle contains over 1,700 semiconductors, and the absence of a few of the cheapest of them—parts worth a dollar or two—was enough to idle the entire assembly line.[41] S&P Global Mobility estimates that the planned production of more than 9.5 million light vehicles was lost worldwide in 2021 alone, with roughly 3 million more in 2022.[42] A multiplicative production function means the whole is hostage to its weakest input, and here that input cost a dollar.

The O-ring logic extends past manufactured goods to the delivery of services. Just as lengthening supply chains left physical production exposed to a single missing input, the migration of services onto shared digital infrastructure has left them exposed to more points of failure. The February 2024 ransomware attack on Change Healthcare, a platform that processes roughly half of the nation's medical claims, affecting some 900,000 physicians, 33,000 pharmacies, and 5,500 hospitals, is one vivid example.[43] A breach through a remote-access portal lacking multifactor authentication halted claims processing, prior authorizations, and prescription transmission

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[39] Daron Acemoglu and Alireza Tahbaz-Salehi, "The Macroeconomics of Supply Chain Disruptions," *Review of Economic Studies* 92, no. 2 (2025): 656–695, https://academic.oup.com/restud/article-abstract/92/2/656/7643479.

[40] Charles Jones, "Intermediate Goods and Weak Links in the Theory of Economic Development." *American Economic Journal: Macroeconomics* 3, no. 2 (2011): 1–28. https://doi.org/10.1257/mac.3.2.1.

[41] U.S. Department of Commerce, Bureau of Industry and Security, *Public Report on the Use of Mature-Node Semiconductors* (Washington, DC: December 2024), 5, https://www.bis.gov/media/documents/public-report-use-mature-node-semiconductors-december-2024

[42] "The Semiconductor Shortage Is—Mostly—Over for the Auto Industry," *S&P Global Mobility*, July 12, 2023. https://www.spglobal.com/mobility/en/research-analysis/the-semiconductor-shortage-is-mostly-over-for-the-auto-industry.html; Alliance for Automotive Innovation. "The Automotive Semiconductor Supply Chain Is (Still) Vulnerable." August 19, 2025. https://www.autosinnovate.org/posts/blog/auto-semiconductor-supply-chain-still-vulnerable.

[43] Change Healthcare, a subsidiary of UnitedHealth Group's Optum division, was breached by the ALPHV/BlackCat ransomware group in February 2024; the company handled 15 billion transactions annually when it was targeted and affected around 190 million Americans. "Cyberattack Paralyzes the Largest U.S. Health Care Payment System." *New York Times*, 2024. https://www.nytimes.com/2024/03/05/health/cyberattack-healthcare-cash.html.

nationwide; a March 2024 American Hospital Association survey found 74 percent of hospitals reporting a direct effect on patient care, and more than 90 percent of the nation's pharmacies were forced onto workarounds.[44] One vulnerability at a vendor became the entire health system's weakest link. Whether the next supply failure originates in a rare-earth mine or a claims-processing server, the underlying logic is the same: O-ring concentration anywhere in the chain, be it in goods or services, has the potential to turn an ordinary vulnerability into a systemic one.

Any concentrated dependency that functioned for decades as an ordinary commercial efficiency also becomes, in a fractured geopolitical environment, a potential lever of coercion. Moreover, relocating any of those stages to a different country involves costs. Recent work documents exactly this re-sorting of trade and investment along geopolitical lines, and estimates a real output cost as a result.[45] EY-Parthenon estimates the additional capital required for the U.S., the Eurozone, and the United Kingdom to end their dependence on China in critical sectors at roughly $24 trillion over 25 years, or about $900 billion a year.[46] Aiyar et al. (2023) in a survey of the literature find the impact to output: trade fragmentation alone could reduce global output by anywhere from 0.2 percent in a limited-fragmentation, low-adjustment-cost scenario to as much as 7 percent in a severe one, with losses reaching 8 to 12 percent in the most exposed countries once technological decoupling is layered on.[47]

The second feature is how these shocks propagate. Historically, for example, most tax changes were seen to be credible and mostly permanent (though sometimes they were explicitly temporary), so firms and individuals could start to respond to them immediately. By contrast, a geopolitical supply shock involves multiple stages that slow its propagation through the input-output network of the economy, with long and uneven lags. Such a staged propagation followed Russia's invasion of Ukraine: global agricultural commodity prices peaked in March 2022, but euro area consumer food inflation did not peak until March 2023, at around 15 percent—a full year later, after traveling from commodity prices through farm-gate prices and food-processor prices to the shelf.[48] This

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[44] American Hospital Association survey of nearly 1,000 hospitals, March 2024, cited in AHA, "AHA Survey: Change Healthcare Cyberattack Significantly Disrupts Patient Care, Hospitals' Finances," 2024, https://www.aha.org/2024-03-15-aha-survey-change-healthcare-cyberattack-significantly-disrupts-patient-care-hospitals-finances); pharmacy workaround figure from UnitedHealth Group update, February 27, 2024, cited in Cybernews, "UnitedHealth gives update on cyberattack and pharmacy backlog," 2024, https://cybernews.com/news/unitedhealth-change-healthcare-cyberattack-pharmacy-backlog/.

[45] Shekhar Aiyar et al., "Geoeconomic Fragmentation and the Future of Multilateralism," *IMF Staff Discussion Note 2023/001*, 2023, https://www.imf.org/en/publications/staff-discussion-notes/issues/2023/01/11/geo-economic-fragmentation-and-the-future-of-multilateralism-527266.

[46] "Cutting China Reliance Would Cost the West $23tn, Research Suggests," *Financial Times*, July 13, 2026, https://www.ft.com/content/c6c1f5a5-3332-471b-87d5-253e03f8b90a. Analysis by EY-Parthenon.

[47] Aiyar et al., "Geoeconomic Fragmentation and the Future of Multilateralism."

[48] European Central Bank, "What Were the Drivers of Euro Area Food Price Inflation over the Last Two Years?" *Economic Bulletin* 2, (2024), https://www.ecb.europa.eu/press/economicbulletin/focus/2024/html/ecb.ebbox202402_04~9b36bced23.en.html.

empirical signature was also visible in the pandemic-era inflation, which developed in waves rather than as a clean, immediate shift.[49]

Section V: Implications

The dominance of the supply side reshapes how we should think about many issues, including inflation, monetary policy, the role of chokepoints, and the (rising) variance of performance across firms.

- For inflation, it means a central forecasting task is now tracking lags, from delivery times to margins, rather than reading labor-market slack. For monetary policy, the same challenge now faces central banks. And we would argue that central banks should be more hesitant to look through supply shocks than they were in the past.
- For the structure of the global economy, the most consequential disruptions increasingly arrive by design, through concentrated and non-substitutable chokepoints that impose costs merely by existing. The defense against them is investment in elastic supply.
- For firms, this new era means that where a company sits in a production network, and on which side of a state action it falls, affects its performance more than its exposure to the business cycle does, widening a dispersion that was already decades in the making.

Despite it seeming that we live in an increasingly virtual world, the binding constraints in this new era remain stubbornly physical: seabed cables, a single quartz mine, and an island's fabrication capacity.

Implication 1: Inflation

The expanded role of the supply side introduces complex lags: the time it takes firms to reset margins, reset inventories, and re-price contracts after a shock. Tracking those lags has increasingly become a central task for inflation forecasters.

What Caused Pandemic-Era Inflation

[49] Brooks, Orszag, and Murdock, "COVID-19 Inflation Was a Supply Shock." As an aside, the rise of the supply side may merely be returning to a world it has seen before. The Great Inflation of the 1970s was, in important part, a geopolitically triggered supply shock—the OPEC embargo and the Iranian revolution hitting an accommodative policy regime and an economy with little short-run ability to substitute, landing on the prices households notice most, and de-anchoring expectations. That episode predated the shock absorber that hyper-globalization later built. Viewed this way, the era of elastic supply looks less like the natural state of affairs than like the historical exception, bracketed on both sides by supply-shock regimes.

The clearest evidence may come from the pandemic. As mentioned earlier, Brooks, Murdock, and Orszag built an econometric model linking core PCE inflation to supply-chain disruption, labor-market tightness, oil prices, and the dollar. The results show that supply disruptions—not excess demand—drove the bulk of the COVID-era surge. Delivery times alone explained roughly 60 percent of year-over-year inflation in the fourth quarter of 2021; adding margins and orders-minus-inventories raises that share to almost 80 percent.[50] In our work, these supply-driven factors including margins largely crowded out any explanatory role for demand indicators like labor-market tightness as measured by the vacancy-to-unemployment ratio.

Why treat margins as a supply variable at all? Because during the pandemic, they were the price expression of scarcity. When restocking became slow and unreliable, firms raised the prices they charged faster than the prices they paid—not out of greed, but to keep shelves from emptying: a higher markup slows the drawdown of scarce inventory. The timing provides confirmation: margins rose six months to a year after delivery delays spiked, and unwound long after delivery times normalized, tracking the supply disruption's schedule rather than the demand cycle's.

The margins channel is also where the lag lives. Delivery times returned to pre-COVID levels in late 2022, but margins normalized far more slowly. To the extent the pipeline was going to drain regardless of the federal funds rate, the 2022–23 hiking cycle deserves less of the credit for taming inflation than it is usually given.

Independent evidence supports both the network and the microeconomic mechanics of the supply story. Di Giovanni, Kalemli-Özcan, Silva, and Yildirim (2022) show that the pandemic's compositional shift from services to goods was amplified through global input-output linkages, and that demand stimulus, absent the adverse sectoral supply shocks, could not account for inflation of the magnitude actually observed. The pattern was not uniquely American: in the euro area, they find, foreign shocks and global supply-chain bottlenecks mattered far more than domestic demand in explaining inflation over 2020-21. Where an economy sits in the global production network, not the stance of its own fiscal policy, was a strong determinant of its inflation experience.[51] In a companion paper, the same authors decompose inflation into domestic and international sources and find the spillovers were unevenly distributed: shocks from the rest of the world mattered far more for euro-area inflation than for U.S. inflation, especially during the supply-chain bottlenecks of 2020, and the euro area was also harder hit by the energy shock from Russia's invasion of Ukraine.[52] Kemp, Portillo, and Santoro (2023) quantify the global toll and estimate that supply disruptions subtracted 0.5 to 1.2 percent from global value added during the

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[50] Robin Brooks, Peter R. Orszag, and William E. Murdock III, *COVID-19 Inflation Was a Supply Shock*, (Brookings Institution, August 15, 2024), https://www.brookings.edu/articles/covid-19-inflation-was-a-supply-shock/.

[51] Julian di Giovanni, Şebnem Kalemli-Özcan, Alvaro Silva, and Muhammed A. Yildirim, "Global Supply Chain Pressures, International Trade, and Inflation," NBER Working Paper 30240 (2022), https://www.nber.org/papers/w30240.

[52] Julian di Giovanni, Şebnem Kalemli-Özcan, Alvaro Silva, and Muhammed A. Yildirim, "Pandemic-Era Inflation Drivers and Global Spillovers," NBER Working Paper 31887 (Cambridge, MA: National Bureau of Economic Research, November 2023), https://www.nber.org/papers/w31887.

2021 recovery while also adding roughly a full percentage point to global core inflation that year—a simultaneous hit to output and prices that is the signature of a supply shock, not a demand boom.[53] At the micro level, Cavallo and Kryvtsov (2023), using daily online price data, find that a doubling of the U.S. stockout rate—from 10 to 20 percent—raises monthly inflation by roughly 0.10 percentage point, with larger and more persistent effects for import-intensive goods.[54]

How one reads the evidence on the primary drivers of inflation also affects how one views the 2022–23 tightening cycle. For example, if the disinflation from the 2022 peak was mostly supply-linked, it would have mostly gone away on its own, with delivery times normalizing and margins unwinding. In that case, the Fed's hikes played only a modest role in bringing inflation down, and the tightening carried its usual costs in foregone output and employment risk while buying little inflation reduction.[55] The potential reason for that weak traction is the slope of the Phillips curve. Hazell, Herreño, Nakamura, and Steinsson (2022), using evidence from U.S. states, find the curve is flat: most of the movement of inflation is carried by long-run expectations rather than by slack.[56] If demand barely moves inflation through the slack channel, a central bank's traction on supply-originated inflation is limited by construction. Benigno and Eggertsson (2023), by contrast, argue that the Phillips curve is highly nonlinear in labor-market tightness: when vacancies relative to unemployment rise above a threshold, the relationship between slack and inflation steepens sharply.[57] On their reading, the inflation of 2021–22 was driven substantially by an extraordinarily tight labor market operating in this steep region, and the subsequent disinflation was achieved rapidly and without a large rise in unemployment, implying the rate hikes likely did meaningful work. Their work disagrees with the assertion in Brooks, Orszag, and Murdock (2024) that once supply-side proxies such as delivery times and margins are included, they displace much of the explanatory power of labor-market tightness in the inflation regressions. This turns in part on measurement.[58]

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[53] Harri Kemp, Rafael A. Portillo, and Marika Santoro, "Assessing the Impact of Supply Disruptions on the Global Pandemic Recovery," IMF Working Paper 2023/042, (2023), https://www.imf.org/-/media/files/publications/wp/2023/english/wpiea2023042.pdf.

[54] Alberto Cavallo and Oleksiy Kryvtsov, "What Can Stockouts Tell Us about Inflation? Evidence from Online Micro Data," *Journal of International Economics* 146 (December 2023): 103769, https://doi.org/10.1016/j.jinteco.2023.103769.

[55] Brooks, Orszag, and Murdock, "COVID-19 Inflation Was a Supply Shock."

[56] Jonathon Hazell, Juan Herreño, Emi Nakamura, and Jón Steinsson, "The Slope of the Phillips Curve: Evidence from U.S. States," *Quarterly Journal of Economics* 137, no. 3 (2022): 1299–1344, https://www.nber.org/papers/w28005.

[57] Pierpaolo Benigno and Gauti B. Eggertsson, "It's Baaack: The Surge in Inflation in the 2020s and the Return of the Non-Linear Phillips Curve," NBER Working Paper 31197 (2023), https://www.nber.org/papers/w31197.

[58] Paul Beaudry, Chenyu Hou, and Franck Portier, "On the Fragility of the Nonlinear Phillips Curve View of Recent Inflation," NBER Working Paper 33522 (February 2025), https://doi.org/10.3386/w33522, show the estimated nonlinearity is sensitive to how inflation expectations are specified.

Comin, Johnson, and Jones (2023) offer a way to hold both accounts at once.[59] In their model, binding sector-level capacity constraints account for roughly half of the 2021–22 inflation surge—supporting the supply side reading—but the mechanism is an interaction: tight capacity amplified the effect of strong demand, so that the level of demand pressing against the constraint remained policy-sensitive even as the timing of the shock was set on the supply side. Other decompositions of the episode find different relative importance of supply as phases of the pandemic evolved.[60]

Related recent work sharpens the question beyond "flat" or "steep": the Phillips curve may be flat for ordinary fluctuations but steepens sharply in the tails, when shocks are large enough to change how firms set prices. Gagliardone, Gertler, Lenzu, and Tielens (2025), using data on Belgian manufacturing firms, rebuild the Phillips curve on production costs rather than slack and find it far steeper than standard output-gap formulations suggest, a result they reconcile with the flat curve found elsewhere by pointing to a low output elasticity of marginal cost.[61] In a companion paper, the same authors show this breaks down under large shocks: once cost shocks cross a threshold—around a 20 percent annual increase in their data—pass-through accelerates and firms reset prices far more frequently, the signature of state-dependent pricing.[62]

Inflation in 2026

In January 2026, Adam Posen and Orszag argued that the consensus expecting inflation to glide back toward 2 percent was likely to be wrong and that the risks pointed to levels of perhaps even 4 percent by year-end. The case rested on a variety of drivers, including lagged tariff pass-through, a fiscal deficit possibly exceeding 7 percent of GDP, immigration shocks, and drifting inflation expectations.[63] The tariff argument was driven by the supply-side lag logic. Pass-through had been modest in 2025—importers absorbing costs, inventories bought ahead of the tariffs, firms

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[59] Diego Comin, Robert C. Johnson, and Callum J. Jones, "Supply Chain Constraints and Inflation," NBER Working Paper 31179 (2023), https://www.nber.org/papers/w31179.

[60] See Adam Hale Shapiro, "Decomposing Supply and Demand Driven Inflation," *Journal of Money, Credit and Banking* 58, no. 2 (2026): 365–388, https://doi.org/10.1111/jmcb.13209, and Ben S. Bernanke and Olivier J. Blanchard, "What Caused the U.S. Pandemic-Era Inflation?" *American Economic Journal: Macroeconomics* 17, no. 3 (2025): 1–35, https://www.aeaweb.org/articles?id=10.1257/mac.20230195. Comin, Johnson, and Jones identify supply structurally, as an occasionally binding capacity constraint. Shapiro identifies it from the signs of price and quantity residuals across PCE categories, a measure of the share of inflation occurring in categories that experienced at least a supply shock, not of the relative size of structural shocks. Bernanke and Blanchard identify it from a small, estimated wage-price-expectations system, assigning the initial surge to shocks to prices given wages and the persistence to labor-market tightness.

[61] Luca Gagliardone, Mark Gertler, Simone Lenzu, and Joris Tielens, "Anatomy of the Phillips Curve: Micro Evidence and Macro Implications," *American Economic Review* 115, no. 11 (2025): 3941–3974, https://www.aeaweb.org/articles?id=10.1257/aer.20231569.

[62] Luca Gagliardone, Mark Gertler, Simone Lenzu, and Joris Tielens, "Micro and Macro Cost-Price Dynamics in Normal Times and During Inflation Surges," NBER Working Paper 33478 (2025), https://www.nber.org/papers/w33478.

[63] Peter Orszag and Adam Posen, "The Risk of Higher US Inflation in 2026," Peterson Institute for International Economics (2026), https://www.piie.com/blogs/realtime-economics/2026/risk-higher-us-inflation-2026.

raising prices in small increments rather than all at once—but it would build through the first half of 2026 as stockpiled inventory ran out, adding roughly 50 basis points to headline inflation by mid-year.

By July 2026, headline PCE inflation held at a 3.7 percent year-over-year rate for a second straight month after reaching 4.1 percent in May, while core PCE was unchanged at 3.3 percent year-over-year in July.[64] The energy-price spike the Iran War produced did not create the entire inflation problem (the tariff and labor-supply pressures were already in motion). Minton, Ray, and Somale (2026) of the Federal Reserve estimate that the 2025 tariffs raised core PCE prices by about 0.8 percent through February 2026, with pass-through building over roughly seven months—modest at first, then arriving with a lag, exactly as predicted.[65]

What This Means for Monetary Policy

How monetary policy should respond to a supply shock is not a new question. The textbook version is familiar: a negative supply shock reduces output and raises prices. Because traditional policy levers cannot alleviate the negative supply shocks, the textbook resolution is to look through them, since a supply shock produces a one-time shift in the level of prices, not a sustained change in the rate of inflation. The prescription holds assuming that inflation expectations stay anchored while the price level adjusts. For most of the elastic-supply era, the condition held. Shocks were infrequent and could plausibly be read by households and firms as exactly what the textbook said it was: a price-level event that would not repeat.

The issue is that we do not seem to be in this textbook land anymore. Implicit in the old argument is the assumption that supply shocks have no intrinsic autocorrelation, that they generate one-off changes to the price level. But the new supply-side era violates that assumption. Supply shocks are indeed growing more autocorrelated given the increased prevalence of chokepoints and great power competition. When today's supply shock increases the probability of another tomorrow, the "look-through" prescription loses its analytical underpinning.

Put differently, six major supply shocks in six years is not a sequence of one-time price effects—it is, to anyone forming expectations from experience, simply inflation. There is no statistical test by which a household can distinguish repeated price-level shifts from an ongoing inflation process. In addition, when supply shocks originate in the deliberate choices of governments rather than in weather and accidents, their frequency is elevated by construction. Through directionally indicative data, we may be seeing a firming of expectations from the repeated supply shocks as

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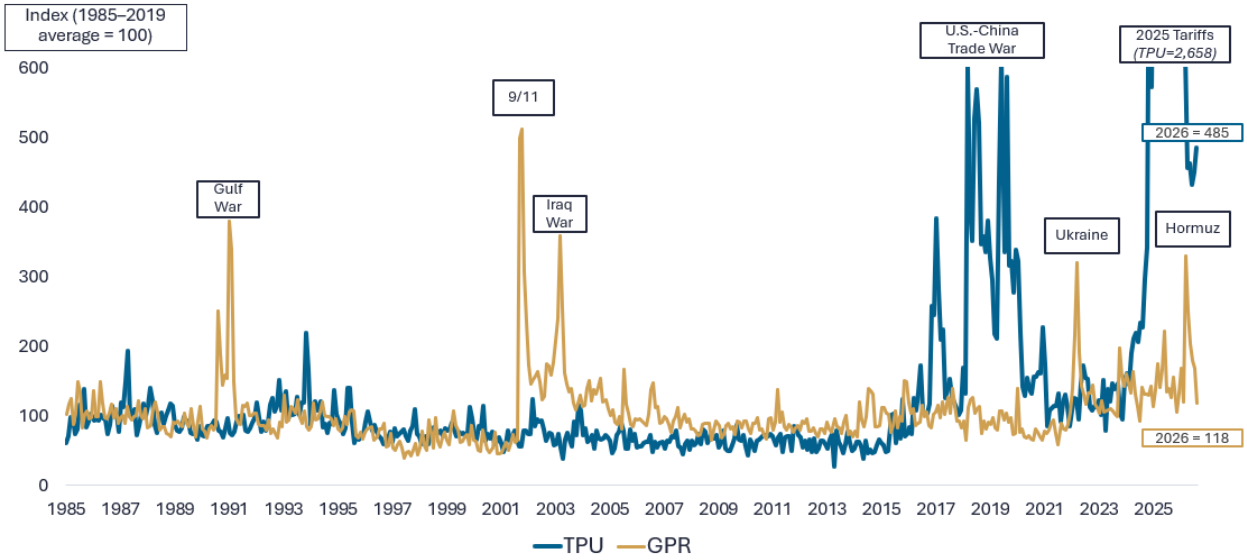
[64] Bureau of Economic Analysis, "Personal Income and Outlays, July 2026," https://www.bea.gov/news/2026/personal-income-and-outlays-july-2026.

[65] Robert Minton, Madeleine Ray, and Mariano Somale, "Detecting Tariff Effects on Consumer Prices in Real Time, Part II," *FEDS Notes* (Washington: Board of Governors of the Federal Reserve System, April 8, 2026), https://www.federalreserve.gov/econres/notes/feds-notes/detecting-tariff-effects-on-consumer-prices-in-real-time-part-II-20260408.html.

evidence: 5-year inflation expectations, according to a survey conducted by the University of Michigan, have increased since the beginning of 2025 to well over 3 percent per year.[66]

As Figure 7 shows, both geopolitical risk and trade-policy uncertainty now stand at levels recorded only a handful of times in the modern era. These indices are, in effect, a running measure of shock frequency and intensity: the share of news coverage devoted to war threats, military escalation, and trade disruption. Read that way, the past five years look less like a run of bad luck than a durable shift in the rate at which supply shocks arrive, and each new spike is another event that households and firms must classify as either a one-off or persistent.

Figure 7. Geopolitical risk and trade-policy uncertainty are running at levels seen only a handful of times in 40 years.



Caldara-Iacoviello Geopolitical Risk index—the share of articles in 10 major newspapers discussing adverse geopolitical events (war threats, terror acts, military buildups), normalized to average 100 over 1985-2019. Trade Policy Uncertainty index (Caldara, Iacoviello, Molligo, Prestipino, Raffo)—the share of articles in seven newspapers discussing trade policy uncertainty, normalized to the same average and timescale. Both series through August 2026. Source: matteoiacoviello.com (Caldara and Iacoviello, 2022; Caldara et al., 2020).

In addition, supply shocks pose a unique risk to monetary policy because they often fall on the prices consumers encounter most frequently—food and fuel above all, but with other consumer goods playing a role—and households tend to weight these salient, everyday prices more heavily than their actual share of spending when forming a sense of where inflation is headed. As a result, a supply disruption can move inflation expectations by more than its economic footprint would suggest and in ways that are difficult to anticipate—so a shock the Fed might prefer to "look through" can instead seep into expectations and take on a persistence of its own.[67]

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[66] University of Michigan, "Expected Change in Prices During the Next 5 Years," *Surveys of Consumers*, https://www.sca.isr.umich.edu/.

[67] Olivier Coibion and Yuriy Gorodnichenko, "Is the Phillips Curve Alive and Well After All? Inflation Expectations and the Missing Disinflation," *American Economic Journal: Macroeconomics* 7, no. 1 (2015): 197–232, https://www.aeaweb.org/articles?id=10.1257/mac.20130306

Beyond an environment in which supply shocks drive a large share of inflation, the transmission mechanisms that bear most on demand-driven inflation may also be weakening. As Posen and Orszag have argued, monetary policy bites less than it once did because large technology companies fund investment largely from cash flow rather than debt markets, while private credit—now roughly $2 trillion—provides an alternative financing channel that responds differently to rate changes.[68] Sløk (2025) documents the household and corporate side of the same phenomenon: borrowers locked in low fixed-rate debt during the pandemic, and net corporate interest payments as a share of operating surplus fell even as the Fed hiked.[69]

The lags are long and variable, as Friedman said, but this time they run through container ships, inventories, and corporate margins rather than through the money supply, and they arrive often enough that a central bank can no longer treat each shock as the last.

Implication 2: Centrality of Chokepoints and the O-Ring

Chokepoints are where the return of the supply side can be seen most clearly. Supply shocks are usually cast as bad luck: transitory disruptions that strike largely at random and unwind on their own. Yet the most consequential now arrive by design. Per the O-ring theory, as global commerce is routed through a handful of concentrated, non-substitutable nodes, a disruption at any one of them is amplified into a shock that is larger than standard models assume.

The sections below first establish chokepoints as a concept supported by a body of existing literature; then show how the most consequential supply shocks of the past five years have increasingly been triggered deliberately as instruments of state policy; and finally quantify how such location-specific shocks, regardless of their trigger, pass through to output and inflation.

Chokepoints as a Real Source of State Power

As globalization has increased, so too has the proliferation of chokepoints. From Hirschman's initial framing in the 1940s, they have emerged as salient features of the geopolitical landscape that provide both opportunity and vulnerability to state actors wishing to exploit newly integrated global systems.[70] In his 2025 book *Chokepoints: American Power in the Age of Economic*

[68] Peter Orszag and Adam Posen, "The Risk of Higher US Inflation in 2026," Peterson Institute for International Economics, 2026, https://www.piie.com/blogs/realtime-economics/2026/risk-higher-us-inflation-2026.

[69] Torsten Sløk, "Weak Monetary Policy Transmission Mechanism," *Apollo Academy*, 2025, https://www.apolloacademy.com/weak-monetary-policy-transmission-mechanism/.

[70] The foundational statement is Albert O. Hirschman, *National Power and the Structure of Foreign Trade* (Berkeley: University of California Press, 1945); for the modern network reformulation see Farrell and Newman, "Weaponized Interdependence: How Global Economic Networks Shape State Coercion," *International Security* 44, no. 1 (2019): 42–79; for a general-equilibrium formalization, Clayton, Maggiori, and Schreger, "A Framework for Geoeconomics," *Econometrica* 94, no. 1 (January 2026): 105–136; and for a taxonomy treating chokepoint power as one of six types of economic power, Harrell, "The Future of American Economic Power," Carnegie Endowment, 2026.

Warfare,[71] Edward Fishman sets three conditions that define a true chokepoint:

1. a single state or close coalition holds a near-monopoly over the market;
2. no substitute is available in the short run; and
3. the position can be weaponized asymmetrically—imposing more pain on the target than on the state that wields it.

Fishman's definition expands beyond the usual physical examples of chokepoints, like straits and canals, into intangible ones: dollar clearing, export-controlled technology, and even maritime insurance. Since the U.S. sits at the center of these financial and technological networks, it has been able to use these chokepoints with little need for coalition-building. A chokepoint is, in network terms, a hub node. But where typical models draw failures at random, here the failure is chosen.[72]

Clayton, Maggiori, and Schreger (2024) give this framework some formal economic backing: coercion is credible only where contracts are incomplete and substitutes are poor, so it is the low elasticity of substitution that turns an ordinary commercial dependency into an instrument of state power.[73] In their framing, what matters is the threat rather than the realized punishment: a hegemon extracts compliance because it can make one demand enforceable through many otherwise unrelated economic relationships at once. In later work, Clayton, Maggiori, and Schreger (2026) locate that power specifically in bundling: a state that can enforce across a dozen separate economic relationships at once can convert scattered commercial dependencies into a single instrument.[74]

In his paper "The Future of American Economic Power," Harrell (2026) presents a key qualification for anyone tempted to treat the power of chokepoints as permanent. He argues that using a chokepoint begins to erode its own usefulness. The moment a dependency is weaponized, everyone who relies on it acquires a reason to engineer a way around it.[75] However, because of bottlenecks to construction, it takes time to de-risk chokepoints, which does not help to alleviate near-term supply disruptions. Harrell's warning is a cousin of Goodhart's law: once used, it can

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[71] Edward Fishman, *Chokepoints: American Power in the Age of Economic Warfare* (Portfolio, 2025). See also: Edward Fishman, "How to Fight an Economic War: A Field Manual for a Ruptured World," *Foreign Affairs*, April 21, 2026, https://www.foreignaffairs.com/united-states/how-fight-economic-war-fishman.

[72] Daron Acemoglu, Vasco M. Carvalho, Asuman Ozdaglar, and Alireza Tahbaz-Salehi, "The Network Origins of Aggregate Fluctuations," *Econometrica* 80, no. 5 (2012): 1977–2016, https://doi.org/10.3982/ECTA9623.

[73] Christopher Clayton, Matteo Maggiori, and Jesse Schreger, "A Framework for Geoeconomics," Stanford Institute for Economic Policy Research Working Paper 24-01 (January 2024), https://siepr.stanford.edu/publications/working-paper/framework-geoeconomics.

[74] Christopher Clayton, Matteo Maggiori, and Jesse Schreger, "A Framework for Geoeconomics," *Econometrica* 94, no. 1, (2026): 105–136, https://doi.org/10.3982/ECTA23206.

[75] Peter Harrell, "The Future of American Economic Power" Carnegie Endowment June 2026) https://carnegieendowment.org/research/2026/06/the-future-of-american-economic-power.

often stop being a chokepoint.[76]

Russia's avoidance of global financial sanctions is an example of this principle. Sanctions on Russia after the annexation of Crimea prompted the construction of payment infrastructure designed to route around dollar clearing, which became useful to Russia following the additional sanctions imposed after the invasion of Ukraine. More recently, Western efforts to sanction the Russian oil trade by exploiting energy chokepoints were met with massive investment by Russia in evading those chokepoints.[77] Over time, as nations and market participants learn the playbook, they can de-risk in advance and respond more effectively when disruptions come, which reduces the overall severity of supply shocks.

This also answers the strongest objection to the bottleneck framework: that bottlenecks often bind less than they appear to because states and markets adapt. A chokepoint's significance lies not in its aggregate economic impact but in the leverage its existence confers—it need not shut a system down indefinitely, only create a moment of blackout, of panic, of chaos that the wielder can exploit. And even when a chokepoint is weaponized and revealed, as in the case of Russian sanctions, it still takes time to replace.

Supply Shocks Wielded by Design

While supply shocks can occur by chance, the two examples below show how they have become weaponized as instruments of policy, resulting in shocks that have direct effects on inflation and growth.

China's 2025 rare-earth export controls came in two waves and illustrate how a chokepoint can be wielded deliberately by a political actor. The April licensing regime on seven heavy and medium rare earths sent shockwave effects across the globe: within weeks of the April restrictions, auto-industry supply disruptions appeared across the U.S., Europe, and Japan. Baskaran and Schwartz (2026) document a near-collapse in specific flows: yttrium exports to the U.S. fell from 333 tons to 17 tons as measured over two eight-month periods, leaving aerospace manufacturers rationing a material with no ready substitute.[78] China's October expansion of those controls, by contrast, was suspended under the one-year Trump–Xi truce, which expires in November 2026. Analyzing that suspended expansion, Aguilar et al. (2026) note that even though the controls were short-lived, their power lay in the credible threat, which they estimate could cost the U.S. 0.3–0.6 percent of

[76] Goodhart's original formulation held that any statistical regularity we observe tends to "collapse once pressure is placed upon it for control purposes." Charles A. E. Goodhart, "Problems of Monetary Management: The U.K. Experience," in *Papers in Monetary Economics*, vol. 1 (Sydney: Reserve Bank of Australia, 1975).

[77] U.S. Department of the Treasury, "Phase Two of the Price Cap on Russian Oil: Two Years After Putin's Invasion," *Featured Stories* (September 6, 2026), https://home.treasury.gov/news/featured-stories/phase-two-of-the-price-cap-on-russian-oil-two-years-after-putins-invasion.

[78] Gracelin Baskaran and Meredith Schwartz, "Rare Earth Export Restrictions One Year Later," *CSIS Briefs* (Washington: Center for Strategic and International Studies, April 2026), https://www.csis.org/analysis/rare-earth-export-restrictions-one-year-later.

output in a stringent 18-month scenario.[79] More broadly, the International Energy Agency reports that, if fully implemented, China's rare-earth export curbs could put $6.5 trillion of downstream production outside the country at risk each year. The IEA encouraged countries to work multilaterally to stockpile 11 "high-risk" materials, which would require an initial purchase of $9.2 billion and a net annual cost of $900 million to reduce their dependence on these minerals.[80]

Second, the Nexperia episode in 2025 shows how leverage can be exercised deliberately by multiple parties to a dispute. In late September 2025, the Dutch government took control of Nexperia, a maker of basic semiconductors, from its Chinese owner, Wingtech, citing the need to keep Europe from losing technological knowledge and capabilities necessary for its economic security. [81] In early October, Beijing barred Nexperia's Chinese subsidiaries and their subcontractors from exporting finished components made in China, where roughly 80 percent of the company's production capacity is located. Nexperia declared force majeure, disclaiming liability for the shipments it could no longer make. Within weeks, European automakers were reporting inventories of chips measured in weeks.

Nexperia is not a frontier firm. It produces transistors and diodes, technologically mature and priced in cents, but it holds roughly 40 percent of that category in automotive applications, and a part qualified into a vehicle cannot be swapped on a production timescale.[82] Leverage of this kind does not require ownership of a technology, only jurisdiction over a step in making it.

While the episodes above demonstrate chokepoints wielded deliberately, Taiwan's semiconductor capabilities provide a compelling example of a critical resource chokepoint that has yet to be activated. The island fabricates more than 90 percent of the world's most advanced semiconductors.[83] A disruption in the Taiwan Strait, whether by blockade, coercion, or accident,

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[79] Pablo Aguilar, Matthieu Darracq Pariès, Valentin Jouvanceau, Baptiste Meunier, and Tajda Spital, "Global Implications of Export Controls on Rare Earths: A Model-Based Assessment," *ECB Occasional Paper Series* no. 384 (Frankfurt am Main: European Central Bank, 2026), https://www.ecb.europa.eu/pub/pdf/scpops/ecb.op384.en.pdf.

[80] IEA, "Supply Concentration, Export Restrictions and Declining Investment Put Critical Mineral Security at Risk," (July 2026), https://www.iea.org/news/supply-concentration-export-restrictions-and-declining-investment-put-critical-mineral-security-at-risk.

[81] Raffaele Huang, Ryan Felton, and Stephen Wilmot, "The Auto Industry Is Panicking About Another Potential Chip Shortage," *Wall Street Journal*, (October 16, 2025) https://www.wsj.com/business/autos/nexperia-auto-industry-chip-shortage-02f92559; On the roughly eighty percent of Nexperia production capacity in China, see also Nimish Ashar, "Is the Automotive Industry Facing Another Chip Crisis? Nexperia's Control Shift Raises Questions," *S&P Global Mobility AutoTechInsight* (October 23, 2025) https://autotechinsight.spglobal.com/news/5284705/is-the-automotive-industry-facing-another-chip-crisis-nexperias-control-shift-raises-questions.

[82] Nexperia's share of automotive discrete semiconductors is estimated at roughly forty percent by TechInsights; see also Raffaele Huang, Ryan Felton, and Stephen Wilmot, "The Auto Industry Is Panicking About Another Potential Chip Shortage," *Wall Street Journal*, October 16, 2025 https://www.wsj.com/business/autos/nexperia-auto-industry-chip-shortage-02f92559.

[83] International Trade Administration, U.S. Department of Commerce, "Taiwan – Semiconductors Including Chip Design for AI," *Country Commercial Guide* (December 1, 2025) https://www.trade.gov/country-commercial-guides/taiwan-semiconductors-including-chip-design-ai.

would interrupt the supply of leading-edge chips with no near-term substitute anywhere else. Bloomberg Economics estimates that losing access to Taiwan's production would cut global supply of cutting-edge logic chips, and a U.S.–China war over Taiwan would reduce global output by 9.6 percent (about $10.6 trillion) in the first year alone, exceeding the impact of both the global financial crisis and the pandemic.[84] Even a blockade short of war costs the world 5.3 percent of GDP, with chip inventories depleting within weeks and a hit to U.S. GDP of 3.2 percent. To de-risk, TSMC has since committed $265 billion to its production in Arizona, making it one of the largest foreign direct investments in U.S. history.[85]

The Macroeconomic Cost: Pass-Through to Output and Inflation

Whether triggered deliberately or by accident, location-specific supply shocks impose large, measurable macroeconomic costs.

Since roughly 80 percent of goods traded worldwide by volume moves by sea, maritime chokepoints in particular can feed directly into activity and inflation.[86] Carrière-Swallow, Deb, Furceri, Jiménez, and Ostry (2022) quantify this: across 46 countries (1992–2021), a one-standard-deviation (21.8 pp) rise in global shipping costs lifts domestic headline inflation by ~0.15 pp over 12 months, with the effect building gradually, peaking at one year, and reverting six months after that.[87] Using a disruption index built from container-ship AIS data, Bai, Fernández-Villaverde, Li, and Zanetti (2024) show that maritime disruptions can even become stagflationary, with shocks producing large, immediate drops in real GDP and surges in unemployment alongside a persistent rise in inflation.[88]

Two recent episodes bring this mechanism into focus: from 2023–24, a severe drought at Gatún Lake forced the Panama Canal Authority to cut daily transits from roughly 32 to as few as 22–24. At the Suez Canal, the *Ever Given* ran aground and blocked the canal for six days (23–29 March 2021); roughly 12 to 13 percent of world trade transits the Suez Canal, and the blockage held up about $9 billion in goods per day. Känzig and Raghavan (2025) combine narrative accounts of the two disruptions with high-frequency shipping-rate movements around them, and find that a shock

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[84] Welch and Cousin, "The $10 Trillion Fight: Modeling a US-China War Over Taiwan," *Bloomberg*, February 10, 2026, https://www.bloomberg.com/news/articles/2026-02-10/the-10-trillion-fight-modeling-a-us-china-war-over-taiwan.

[85] Taiwan Semiconductor Manufacturing Company, "Second Quarter 2026 Results," TSMC Investor Relations, accessed 2026, https://investor.tsmc.com/english/quarterly-results/2026/q2.

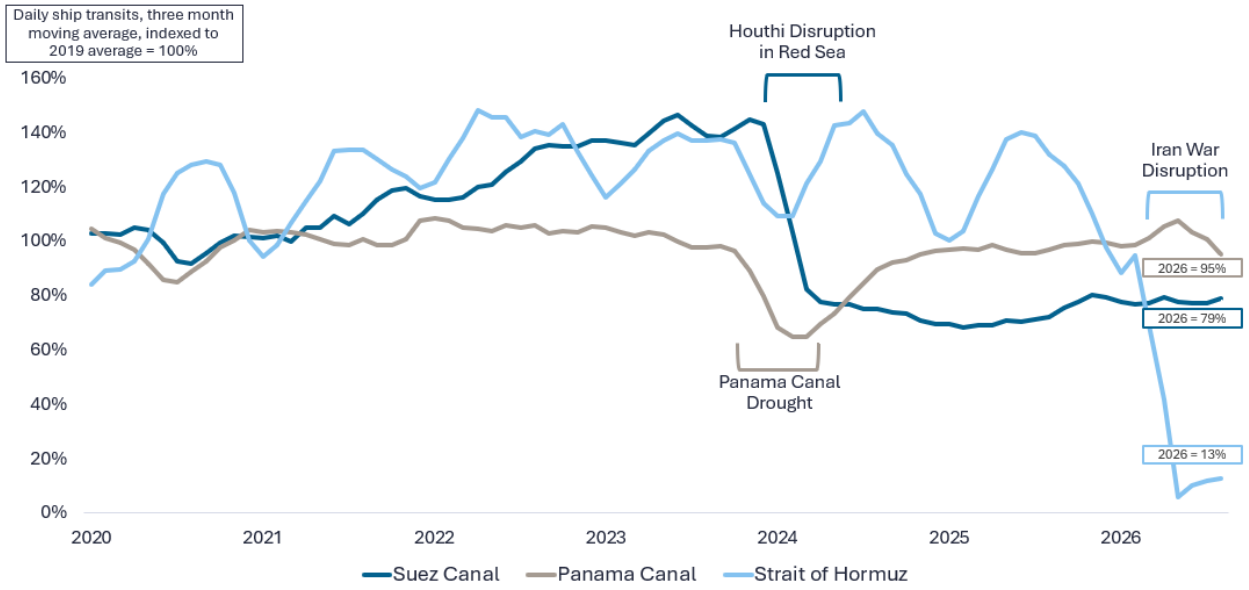
[86] UN Trade and Development (UNCTAD), "Shipping Data: UNCTAD Releases New Seaborne Trade Statistics," April 15, 2025, https://unctad.org/news/shipping-data-unctad-releases-new-seaborne-trade-statistics.

[87] Yan Carrière-Swallow, Pragyan Deb, Davide Furceri, Daniel Jiménez, and Jonathan D. Ostry, "Shipping Costs and Inflation," *Journal of International Money and Finance* 130 (2023): 102771, https://doi.org/10.1016/j.jimonfin.2022.102771.

[88] Xiwen Bai, Jesús Fernández-Villaverde, Yiliang Li, and Francesco Zanetti, "The Causal Effects of Global Supply Chain Disruptions on Macroeconomic Outcomes: Evidence and Theory," NBER Working Paper 32098(2024), https://www.nber.org/papers/w32098.

persistently raising real shipping costs lowers industrial production and broader activity while raising producer and consumer prices, lengthening delivery times, and deepening input shortages.[89] Figure 8 shows how quickly such chokepoints can close: transits through Panama, Suez, and Hormuz each contracted from outside shocks—the last by more than 80 percent.

Figure 8. Chokepoints disrupted critical shipping lanes over the last three years.



Daily transit calls derived from AIS satellite ship-tracking data (IMF PortWatch), averaged by month, indexed to each chokepoint's 2019 average (Suez 52, Panama 32, Hormuz 63 transits per day), and shown as a three-month moving average. Panama Canal transits fell about 40 percent during the 2023-24 Gatún Lake drought; Suez transits fell roughly 40 percent and has not rebounded from late 2023 as Red Sea attacks diverted traffic around the Cape of Good Hope; Strait of Hormuz transits collapsed by more than 80 percent at the height of the 2026 closure. Source: IMF PortWatch (portwatch.imf.org).

This type of shock is not unique to shipping. On March 11, 2011, a magnitude-9.0 earthquake and tsunami struck northeastern Japan, killing roughly 18,000 people, triggering the Fukushima Daiichi nuclear meltdown, and shuttering plants across the country's industrial heartland. Carvalho, Nirei, Saito, and Tahbaz-Salehi (2021)[90] exploit the earthquake as an exogenous regional shock and find it propagated upstream and downstream along supply chains and produced a 0.47 percentage-point decline in Japan's real GDP growth in the year following the disaster, with a significant portion of the impact via input-output linkages to firms with no direct exposure.

A chokepoint can impose costs even before it is used, moreover. Caldara and Iacoviello (2022) construct a news-based index of geopolitical risk stretching back over a century and show that

[89] Diego R. Känzig and Ramya Raghavan, "Supply Chain Shocks and the Macroeconomy: Evidence from Global Shipping Disruption" (working paper, 2025), https://ramyaraghavan.com/assets/files/papers/kaenzig_raghavan_2025.pdf.

[90] Vasco M. Carvalho, Makoto Nirei, Yukiko U. Saito, and Alireza Tahbaz-Salehi, "Supply Chain Disruptions: Evidence from the Great East Japan Earthquake" *Quarterly Journal of Economics* 136, no. 2 (2021): 1255–1321, https://academic.oup.com/qje/article-abstract/136/2/1255/6030033.

elevated geopolitical risk foreshadows lower investment and employment.[91] A chokepoint taxes the economy simply by existing, through the caution it imposes on firms exposed to it, well before any control is even imposed.

Taken together, these episodes provide some recent examples of exogenous, location-specific supply shocks that are first-order determinants of GDP and inflation. The common thread is amplification of supply shocks: because production runs through concentrated, non-substitutable nodes, a disruption at any one point is transmitted and magnified across the network rather than absorbed locally.

Implication 3: The "Abundance" Policy Movement

The rise of the supply side in driving economic activity is spiritually aligned with the core thesis of the abundance movement: that policy should focus on expanding supply, not subsidizing demand, in crucial areas such as housing and healthcare. In some ways, the new supply-side era is a generalization of abundance: the need for American policymakers to focus more on supply expansion (the "abundance" thesis) follows from the increased importance of variation in the global economy's capacity to produce.

In their book *Abundance,* Klein and Thompson (2025) argue that much of the relevant supply constraint is self-inflicted, the product of regulatory choices rather than any real scarcity of land, labor, or materials.[92] They diagnose a governing model that spent decades subsidizing demand for the essentials of a middle-class life (such as housing, higher education, healthcare) while layering procedural constraints on supply: zoning, permitting, environmental review, and the litigation rights that let any of these be used to delay or block a project. The aggregate stakes of these self-inflicted constraints are potentially large.

Energy is a sector with a compelling case for the abundance perspective. As Yergin, Orszag, and Arya (2025) argue, what the world is living through is an energy addition, not a transition.[93] Renewables are accumulating on top of conventional supply rather than replacing it, even as total demand climbs. Lazard's 2026 Levelized Cost of Energy+ Report finds that renewables remain the cheapest new-build generation on an unsubsidized basis even as costs now rise across every technology—and it recommends faster permitting and approvals to keep the grid reliable.[94] The bottleneck it points to is most visible in the queue: Lawrence Berkeley National Laboratory's

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[91] Dario Caldara and Matteo Iacoviello, "Measuring Geopolitical Risk," *American Economic Review* 112, no. 4 (2022): 1194–1225, https://doi.org/10.1257/aer.20191823.

[92] Ezra Klein and Derek Thompson, *Abundance* (New York: Avid Reader Press, 2025).

[93] Daniel Yergin, Peter Orszag, and Atul Arya, "The Troubled Energy Transition: How to Find a Pragmatic Path Forward" *Foreign Affairs* 104, no. 2 (March/April 2025), https://www.foreignaffairs.com/united-states/troubled-energy-transition-yergin-orszag-arya.

[94] Lazard, "Levelized Cost of Energy+ (LCOE+)," 19th ed. (July 2026), https://www.lazard.com/research-insights/levelized-cost-of-energyplus-lcoeplus/.

"Queued Up" update states that, as of the end of 2025, more than 2,060 GW of proposed generation and storage capacity was seeking connection to the grid, the majority of which will likely never be built.[95] Of the capacity that requested connection between 2000 and 2020, only 13 percent had reached commercial operation by the end of 2025, while three-quarters had been withdrawn.

The same delay compounds at every other layer of the energy supply chain. Upstream, developing a major new mine takes more than 20 years globally and, in the U.S., an average of 29 years.[96] Even the equipment is backlogged: Wood Mackenzie's 2025 Supply Chain Report finds that the average delivery lead time for large gas turbines is now almost five years after receipt of order, and notes that lead times may have lengthened further as demand has surged.[97] Storage, which until recently was a source of steady cost declines, has reversed course as tariffs on Chinese lithium-ion cells and new Foreign Entity of Concern rules push the battery supply chain to diversify away from China.[98]

Germany shows what happens when energy resilience is neglected. Weeks before the gas shock from Russia's February 2022 invasion of Ukraine, Germany narrowed its own options by closing three of its six remaining nuclear reactors, which forced the country to rely more heavily on coal to get through the winter.[99] German gas consumption fell about 18 percent in 2022 and the economy still grew, but it did so by adapting to scarcity, not by having built abundance.

Each of these observations is a specific manifestation of elastic supply. The abundance movement reflects a desire to optimize advanced-economy policy postures for a world in which supply shocks are increasingly important.

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[95] Joseph Rand, Anna Cheyette, Chris Talley, Steven Zhang, Will Gorman, Ryan H. Wiser, Joachim Seel, Seongeun Jeong, and Fredrich Kahrl, "Queued Up: 2026 Edition, Characteristics of Power Plants Seeking Transmission Interconnection as of the End of 2025" (Berkeley, CA: Lawrence Berkeley National Laboratory, 2026), https://emp.lbl.gov/queues.

[96] Yergin, Orszag, and Arya, "The Troubled Energy Transition."

[97] "Supply Chain Constraints Limit the Growth of Gas-Fired Generation in the U.S.," *Wood Mackenzie*, https://www.woodmac.com/blogs/energy-pulse/supply-chain-constraints-limit-the-growth-of-gas/.

[98] Lazard, "Levelized Cost of Energy+ (LCOE+)."

[99] Three reactors closed 31 December 2021; the final three on 15 April 2023, after a short crisis-driven extension; polling shortly before found roughly two-thirds of Germans opposed. To offset the loss, Berlin reauthorized nearly 9 GW of coal capacity. U.S. EIA, "Germany Extends the Life of its Last Three Operating Nuclear Power Plants Until April" February 16, 2023; "Germany Closes Its Last 3 Nuclear Reactors," *Energy Post*, 2023; Centre for Eastern Studies (OSW), January 12, 2023.

Implication 4: As Firms Continue to Navigate the New Supply Side, Firm Dispersion Will Continue to Widen

The rise of the supply side also puts a renewed focus on companies, which are typically the channel through which supply shocks are transmitted. This refocusing comes as a welcome development, as introductory treatments of the corporate sector are too casual about the mechanics of transmission. Today, understanding the transmission vector through firms is of first-order importance to understanding macroeconomic fluctuations.

Supply Shocks Sort Firms and Exacerbate Firm Dispersion

Geopolitical supply shocks do not hit firms evenly. Alessandria et al. (2023) model a heterogeneous-firm economy in which companies hold costly inventories against uncertain, delayed restocking. Their key result is that a supply-chain disruption most affects the firms for which restocking is most valuable: the firms that built operating models around just-in-time efficiency and single-source suppliers.[100] In contrast, firms that have built redundant sourcing and geographic supplier diversification exit a supply shock with their margins intact. These differences compound: the disrupted firm loses customers and market share while rebuilding supply, and the advantages of scale that accrue to the firms that kept running are hard to reverse.

Acemoglu and Tahbaz-Salehi (2025) extend this logic directly to supply chains, modeling supplier relationships as customized and costly to form, so that firms adjust not by smoothly re-pricing but along an extensive margin where they must find, qualify, and build new suppliers.[101] Since that adjustment process is slow, even small shocks arrive discretely and unwind gradually, producing discontinuous fluctuations in output. Barrot and Sauvagnat (2016), using three decades of U.S. natural disasters matched to supplier–customer links, find that when a supplier is knocked out, its customers suffer only when the disrupted input is specific and hard to replace, rather than when it is generic.[102] Aggregate shocks, in other words, produce sharply different outcomes across firms depending on how substitutable their sourcing is: the firm with a redundant, generic supply base absorbs the shock, while the one dependent on a single specialized supplier transmits it.

There is also a structural reason why the market alone will not be able to close the gap. Capponi, Du, and Stiglitz (2024) find that market power and incomplete markets cause upstream firms to systematically underinvest in capacity and over-rely on spot procurement, so individual firms, optimizing privately, collectively produce a supply network less resilient than the social

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[100] George Alessandria, Shafaat Y. Khan, Armen Khederlarian, Carter Mix, and Kim J. Ruhl, "The Aggregate Effects of Global and Local Supply Chain Disruptions: 2020–2022," NBER Working Paper 30849 (2023), https://www.nber.org/system/files/working_papers/w30849/w30849.pdf.

[101] Daron Acemoglu and Alireza Tahbaz-Salehi, "The Macroeconomics of Supply Chain Disruptions," *Review of Economic Studies* 92, no. 2 (2025): 656–695, https://doi.org/10.1093/restud/rdae038.

[102] Jean-Noël Barrot and Julien Sauvagnat, "Input Specificity and the Propagation of Idiosyncratic Shocks in Production Networks," *Quarterly Journal of Economics* 131, no. 3 (2016): 1543–1592, https://doi.org/10.1093/qje/qjw018.

optimum.[103] Elliott, Golub, and Leduc (2022) show that firms invest in the reliability of their supply relationships only up to the point where production is barely sustained.[104] The result is a system that settles just above the threshold of cascading failure, which is why the just-in-time firm's model is so fragile and why the market will not, on its own, correct toward the redundancy the network as a whole needs. Firms that do invest ahead of the shock—through dual sourcing, strategic inventory, and diversified supplier relationships—are not simply better managed; they are capturing a market inefficiency their competitors may be collectively underestimating.

Supply shocks are accelerating a divergence of firm returns that was already underway. Furman and Orszag (2018) documented the widening: the ratio of the 90th -percentile firm's return on invested capital to the median firm's began pulling away in the early 1990s.[105] Autor, Dorn, Katz, Patterson, and Van Reenen (2020) find industries have tilted toward a small number of highly productive, high-markup superstar firms, with the falling labor share concentrated precisely in those industries.[106] McKinsey's latest edition of *Valuation: Measuring and Managing the Value of Companies* corroborates this trend, showing that the dispersion across firms of a key efficiency metric, return on invested capital (ROIC), has grown over the past two decades in both the U.S. and Europe (see Figure 9 for the U.S. trends). Among U.S. non-financial companies above $1 billion in revenue, the 95th-percentile firm earned 52 percent ROIC in 2003 and 101 percent in 2023—a 50-point gain. The median moved 8 points over the same period. The 10th percentile was roughly flat.[107] The firms at the top of the distribution are, disproportionately, the ones already equipped to absorb a supply disruption because of better management practices and because they tend to be asset-light businesses that are less exposed to physical chokepoints.

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[103] Agostino Capponi, Chuan Du, and Joseph E. Stiglitz, "Are Supply Networks Efficiently Resilient?," NBER Working Paper 32221 (2024, rev. January 2025) https://doi.org/10.3386/w32221.

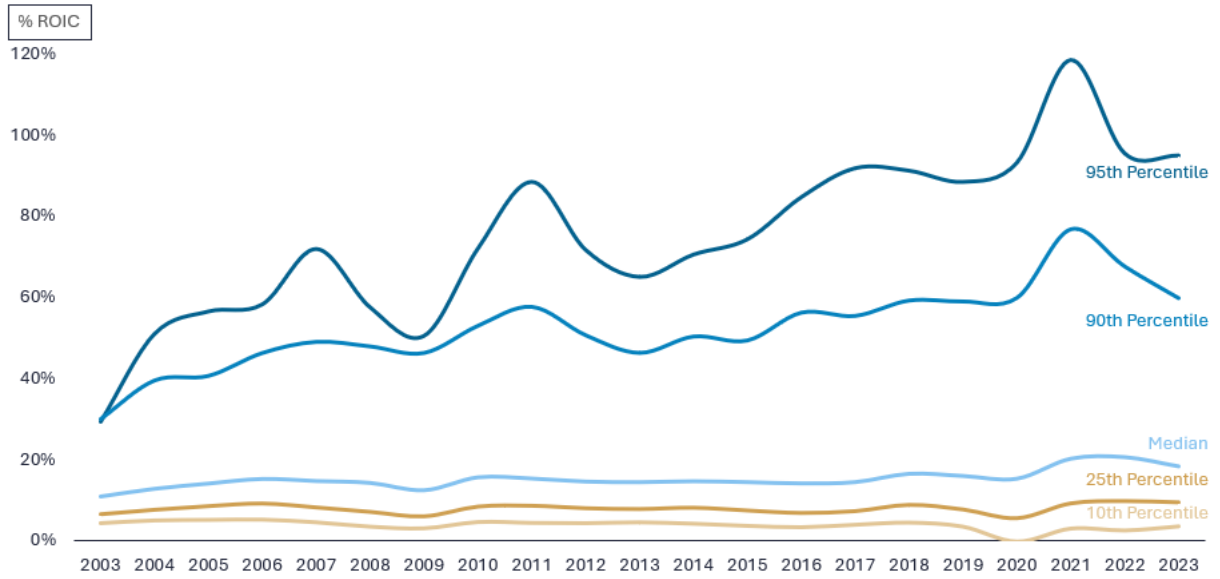
[104] Matthew Elliott, Benjamin Golub, and Matthew V. Leduc, "Supply Network Formation and Fragility," *American Economic Review* 112, no. 8 (2022): 2701–2747, https://doi.org/10.1257/aer.20210220.

[105] Jason Furman and Peter Orszag, "A Firm-Level Perspective on the Role of Rents in the Rise in Inequality," in *Toward a Just Society: Joseph Stiglitz and Twenty-First Century Economics*. Guzman, Martin, ed. (New York: Columbia University Press, 2018), http://www.jstor.org/stable/10.7312/guzm18672.

[106] David Autor, David Dorn, Lawrence F. Katz, Christina Patterson, and John Van Reenen, "The Fall of the Labor Share and the Rise of Superstar Firms," *Quarterly Journal of Economics* 135, no. 2 (2020): 645–709, https://academic.oup.com/qje/article/135/2/645/5721266.

[107] Tim Koller, Marc Goedhart, and David Wessels, *Valuation: Measuring and Managing the Value of Companies*, 8th ed. (John Wiley & Sons, 2025); The ROIC spread data referenced here draws on McKinsey Value Intelligence analysis of U.S. non-financial companies above $1 billion in revenue (inflation-adjusted at any point in time, 2003–2023).

Figure 9. Return on invested capital (ROIC) by percentile, U.S. non-financial companies above $1bn in revenue, 2003–2023: the 95th percentile roughly doubles to 101 percent while the median and bottom decile barely move.



ROIC data includes U.S. non-financial companies above $1bn in revenue (inflation adjusted at any point in time 2003–23); Excludes goodwill and acquired intangibles; percentages rounded to nearest whole percent. Source: Analysis by McKinsey & Company, using McKinsey Value Intelligence.

Dispersion Driven by an Increasingly Small Set of Firms

The frontier-firm dynamic is an explicitly supply-side innovation. The OECD's work on the "best versus the rest" (Andrews, Criscuolo, and Gal, 2016) documented that productivity growth at frontier firms has continued apace while diffusion to everyone else has stalled.[108] That thesis is deepening in the AI era, where the enormous optimism about supply-side growth now embedded in markets rests on the innovations of a small set of frontier labs.

This concentration rewires the geopolitical narrative as well: when the productivity shock comes from so few firms, great-power competition increasingly runs through them. Harrell (2026) frames American primacy in frontier technology as economic power subject to the same self-eroding dynamic as any other: the harder the advantage is pressed, the sharper the incentive for rivals to build around it.[109] At the frontier of AI development, the chip layer and the model layer are eroding at different speeds. On chips, genuine substitution remains years away: SMIC and Huawei are confined to less cutting-edge chip development methods, and even Beijing's own timeline for

[108] Dan Andrews, Chiara Criscuolo, and Peter N. Gal, "The Best Versus the Rest: The Global Productivity Slowdown, Divergence Across Firms and the Role of Public Policy," OECD Productivity Working Papers no. 5 (Paris: OECD Publishing, 2016), https://doi.org/10.1787/63629cc9-en.

[109] Harrell, "The Future of American Economic Power" Carnegie Endowment, 2026.

domestic extreme ultraviolet lithography runs to 2030.[110] [111] On models, though, Chinese labs have narrowed the performance gap already, albeit relying on rented or smuggled American chips.[112] However, a lab does not need to replace American chips to erode the position those chips were meant to protect. It only needs a model good enough to change who buys, who partners, and who sets the pace. Whether the frontier stays American, and whether its gains diffuse beyond the frontier firms themselves, are now supply-side questions of the first order.

The Newest Force Widening the Distribution is the State

The widening of the firm distribution is no longer driven only by market dynamics. Increasingly, it is driven by the government—intervening not through horizontal rules applied to everyone, but through firm-specific, transactional decisions about who gets investment, who faces export controls, and who secures a favored relationship with the state. Miscik, Orszag, and Bunzel (2026) document the shift from rules-based to discretionary state capitalism: from a framework of predictable rules that applied equally to all market participants toward an improvised toolkit of golden shares, direct equity stakes, jawboning, export-fee deals, and firm-specific negotiated arrangements—alongside an erosion of the independent regulatory institutions that once enforced the old framework.[113] Recent instances in the U.S. include direct equity positions in Intel and MP Materials, both justified as strategic investments in critical supply chains.

As an example of overall state intervention, more than 2,500 new industrial policy measures were recorded by the IMF in 2023 alone, of which roughly 71 percent were trade-distorting.[114] And the stated rationale has migrated: where Western industrial policy from 2009 to 2021 was justified mainly on competitiveness and climate grounds, by 2025, more than half of U.S. measures explicitly invoked national security or geopolitical considerations.[115] Figure 11 shows the count of

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[110] Ryan Fedasiuk and Julia Torres, "China's DUV Lithography Loophole: SMIC and Huawei Printing Near-Frontier AI Chips," American Enterprise Institute, April 2026: They find that SMIC and Huawei remain confined to deep-ultraviolet multi-patterning, with 5-nanometer yields reported around 20 percent, and even the Chinese government's own optimistic timeline for domestic EUV production runs to 2030.

[111] Semiconductor Industry Association and Boston Consulting Group, *Emerging Resilience in the Semiconductor Supply Chain* (May 2024), projecting $2.3 trillion of global wafer-fabrication investment over 2024-2032, of which the U.S. captures roughly 28 percent (about $646 billion); U.S. fab capacity is projected to triple. On the timeline for replacing Taiwan's capacity specifically, see Chris Miller, remarks at the Commonwealth Club of California, October 17, 2022, estimating a decade to rebuild that capacity elsewhere, with second-order economic losses in the trillions.

[112] Stanford HAI, *Artificial Intelligence Index Report* (2025 8th ed. and 2026 9th ed.)

[113] Jami Miscik, Peter R. Orszag, and Theodore Bunzel, "The Trouble with State Capitalism," *Foreign Affairs*, 2026, https://www.foreignaffairs.com/united-states/trouble-state-capitalism.

[114] Simon Evenett, Adam Jakubik, Fernando Martín, and Michele Ruta, "The Return of Industrial Policy in Data," IMF Working Paper WP/24/1 (Washington: International Monetary Fund, January 2024), https://www.imf.org/-/media/Files/Publications/WP/2024/English/wpiea2024001-print-pdf.ashx.

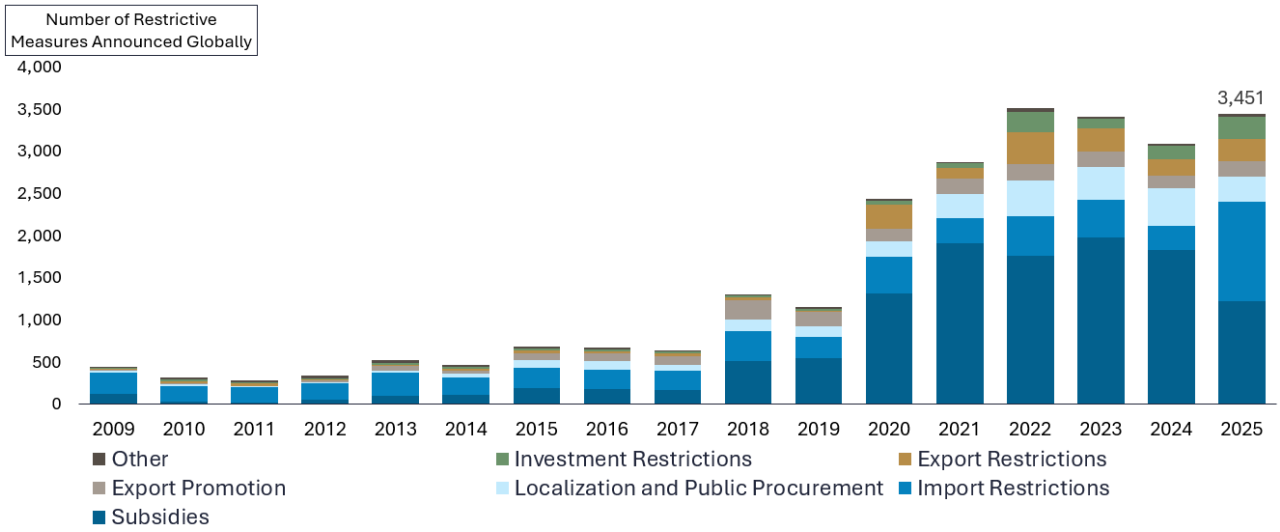
[115] Fernando Martín Espejo, "Security First: How Industrial Policy Changed in 2025," *Global Trade Alert Zeitgeist Series Briefing* no. 79, (December 17, 2025), https://globaltradealert.org/reports/how-industrial-policy-changed-in-2025.

new restrictive measures introduced each year rising roughly five-fold over the past decade. The shift in the mix matters as much as the level: import restrictions have accelerated relative to subsidies and procurement mandates, marking a turn toward tariffs and trade barriers.

The implications for firms are significant and cut in both directions. A company that secures a favored position with the state gains a durable advantage that no competitor can easily replicate through operational excellence alone. And as the state intervenes more often and more selectively, that position is only one entry on a longer list of things that matter more now than they used to: which supplier a firm depends on, which chokepoint its inputs pass through, which side of a state action it ends up on. A shock that travels through a chain takes down everything downstream of the weak link, so a firm's fate depends less on how exposed it is to the business cycle than on where it sits in that chain. Two firms in the same industry, facing the same demand, can have quite different years because one of them sources a critical input from a single supplier in a contested country and the other does not.

The firms best positioned to navigate the new supply side are those that can read the macroeconomic, geopolitical, regulatory, and sector-specific forces shaping their industry before their competitors can and are able to act on it: qualifying a second supplier, moving a plant, securing a license before it becomes leverage against them.

Figure 11. The Number of Restrictive Measures Globally Has Increased Over Time.



Count of new restrictive policy measures introduced annually, by instrument type, 2009-2025. 2025 data as of September. Source: Global Trade Alert policy measures database, St. Gallen Endowment for Prosperity Through Trade; data as of September 2025. Cited in Council on Foreign Relations, U.S. Economic Security Report. Reproduced from Lazard Geopolitical Advisory, "Political Capital: How Geopolitics Is Reshaping Cross-Border Investment and M&A Flows" (May 2026), Figure 1.

Implication 5: Artificial Intelligence

Almost every discussion of AI as an economic event turns on a single question: will the technology deliver? This is an incomplete question, however, because it leaves out the "for whom?"

component—a component specifically relevant to the new supply-side era. The "for whom" question has usually been settled by markets. In the current environment, however, it is increasingly settled by states—from export controls on advanced chips to the deliberate promotion of open-weight models. The history of transformative technology is largely one of innovations that arrived roughly as promised and of returns that went somewhere other than where they were expected. Today, the geopolitical dynamic portends a world where the frontier labs currently perceived to capture much of the profits from AI demand could soon be outcompeted by near-zero-cost models from Chinese firms and other open-source and open-weight model providers.

The clearest modern comparison is the fiber buildout of the late 1990s. Following a significant buildout, by contemporary estimates, only some 3 percent of the fiber laid in that cycle was in use by 2002.[116] Demand did eventually catch up, but only after most of a decade, and only once video streaming and cloud computing created the traffic the original buildout had bet on.

The lesson was not that the fiber optimists were wrong. It is that being right about a technology and being right about who captures its returns are separate forecasts, resolved on different timelines. For our part, we would bet on a large eventual effect on productivity from AI.

Yet despite that optimism about the technology, there remains significant uncertainty over which parts of the AI value chain will realize the bulk of the profit. The current AI buildout presupposes that inference will be purchased continuously, at scale, from a small number of cloud providers, and that the margin on those tokens will service capital already sunk into specialized physical assets—chips, buildings, substations, and cooling.

The return on this capital depends on three conditions: the technology must keep advancing at roughly the pace its builders expect; frontier models must stay far enough ahead of openly available ones to command a premium; and consumption must stay on the metered cloud rather than migrating to compute that buyers own. On the first, we would bet on the technology continuing to advance. But that is precisely what makes the other two worth taking seriously—every advance that makes frontier models more capable also makes smaller, cheaper, self-hosted models sufficient for more of the work.

Consider the second condition. On sheer capability, the gap between frontier and open-weight models has proven durable so far: Epoch AI, which estimates the speed at which open models trail the closed frontier, finds that the trailing gap between these models has reduced to months rather than years.[117] For a large share of enterprise workloads, the operative question thus becomes not which model is best, but which is sufficient at what cost. The answer sets a ceiling on what the frontier can charge for the same task, and compute costs are pulling in the opposite direction. From

[116] Yochi J. Dreazen, "Wildly Optimistic Data Drove Telecoms to Build Fiber Glut," *Wall Street Journal*, September 26, 2002, https://www.wsj.com/articles/SB1032982764442483713.

[117] Epoch AI, "Open Models Lag State-of-the-Art Closed Models by 4 Months," *Epoch AI Data Insights*, May 29, 2026, https://epoch.ai/data-insights/open-closed-eci-gap.

OpenAI to Anthropic, the rapid revenue growth of some of the leading AI companies has come alongside sharply rising compute spend.[118]

The third condition is where computation occurs, and it poses one of the greatest threats to the economics behind the hyperscaler model, which effectively assumes every workload must run on someone else's metered cloud. That belief holds when a handful of companies could build models good enough to matter, but once smaller, cheaper models are good enough for most production work, companies could simply buy the hardware and run it locally themselves. The sharpest version is the air-gapped case: defense, intelligence, healthcare, and parts of financial services, where data cannot leave the perimeter and the cloud-delivered model is not merely more expensive but also unavailable.

The geopolitical implications here are clear. China has championed open-weights models, with capabilities close to those of American frontier labs. The wide availability of reasoning skill at de minimis cost would be a staggeringly positive shock to aggregate supply—but it would accompany a significant loss of Western dominance over AI development.

Implication 6: The Physicality of Supply

For all the talk of an economy moving into the cloud, the shocks that have reordered the macroeconomic landscape over the past five years have been physical: tanks crossing a border, ships needing to reroute around a canal, ore that must be mined and refined in a handful of facilities, chips fabricated on a single island. The more the visible economy has dematerialized, the more its vulnerabilities have concentrated in the physical world.

Start with the cloud itself, which is a metaphor for a set of buildings connected by wires. Submarine fiber-optic cables carry an estimated 95 to 99 percent of intercontinental data traffic.[119] In early 2024, the *Rubymar*, a cargo vessel struck by a Houthi missile, dragged its anchor across the Red Sea floor as it drifted and may have severed up to three cable systems, disrupting roughly a quarter of the traffic between Asia and Europe.[120] Investigators have attributed some cases to deliberate sabotage or accident, but in many cases have been unable to reach a conclusion at all.[121]

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[118] Nestor Maslej et al., *The 2026 AI Index Report* (Stanford, CA: Stanford Institute for Human-Centered Artificial Intelligence, 2026), ch. 4, "Economy," fig. 4.2.20, https://hai.stanford.edu/ai-index/2026-ai-index-report/economy.

[119] International Telecommunication Union, "Submarine Cable Resilience," ITU Backgrounder, https://www.itu.int/en/mediacentre/backgrounders/Pages/submarine-cable-resilience.aspx

[120] Erin L. Murphy and Thomas Bryja, "The Strategic Future of Subsea Cables: Egypt Case Study" (Center for Strategic and International Studies, November 12, 2025), https://www.csis.org/analysis/strategic-future-subsea-cables-egypt-case-study.

[121] Elizabeth Braw, "How the Baltic Sea Nations Have Tackled Suspicious Cable Cuts" (Atlantic Council, November 26, 2025). https://www.atlanticcouncil.org/in-depth-research-reports/issue-brief/how-the-baltic-sea-nations-have-tackled-suspicious-cable-cuts/

Worldwide, around 200 cable faults occur in a typical year, almost all of them accidental. The system absorbs them, but these faults represent another node for state actors to target intentionally.

The concentration runs deeper than the wires. Ed Conway's *Material World* traces the digital economy to an improbable point: Spruce Pine, North Carolina, a town of roughly 2,000 people. The town's mines supply the overwhelming share of the world's high-purity quartz, the material required for the containers in which polysilicon is melted for semiconductor wafers. "It is rare, unheard of almost, for a single site to control the global supply of a crucial material," Conway writes.[122] In September 2024, Hurricane Helene dropped two feet of rain on Spruce Pine, flooding the town, cutting power, and shutting down mining operators for roughly two weeks. In O-ring terms, the quartz containers are a textbook case where the removal of a trivially cheap input has the potential to impact disproportionate amounts of downstream capacity.

The same logic extends upward to the satellite constellations that provide positioning and timing signals to logistics, finance, and power grids. These are physical assets in contested orbits, single systems on which vast digital superstructures silently depend. In April 2024, Finnair suspended its Helsinki–Tartu service for a month after two aircraft were turned back because GPS interference left them unable to land at the Estonian airport, whose approach procedures depended on the signal.[123] One recent report identified 75 episodes of brief, high-powered interference over Europe since October 2019 and traced at least three to satellites in Russia's EKS early-warning constellation.[124] The outages ran under 10 seconds, reached from Iceland to Italy, and degraded American, European, and Chinese navigation signals while leaving Russia's own untouched.[125] These outages were too brief to do significant damage, which is the wrong measure of the risk. Consider how tightly the dependency runs: financial exchanges timestamp trades against GPS-disciplined clocks. EU rules require high-frequency trading firms to synchronize their clocks to within 100 microseconds of coordinated universal time, a requirement met in practice overwhelmingly via satellite timing.[126] An emitter that degrades everyone else's navigation while leaving its operator's intact is not just a nuisance, but an asymmetry. This asymmetry invites exploitation with enormous consequences. As the head of Britain's Royal Institute of Navigation

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[122] Ed Conway, *Material World: The Six Raw Materials That Shape Modern Civilization* (2023), 105.

[123] "Finnair Pauses Some Estonia Flights Due to GPS Interference," *Reuters*, April 29, 2024, https://www.reuters.com/world/europe/finnair-pauses-flights-tartu-estonia-amid-gps-interference-2024-04-29/

[124] Zachary L. Clements, Argyris Kriezis, and Todd E. Humphreys, "Chasing Lightning: Detecting, Characterizing, and Identifying a Powerful Space-Based GNSS Interference Source," arXiv preprint arXiv:2606.03673v1, June 2026, https://arxiv.org/abs/2606.03673.

[125] Riley Mellen and Eric Schmitt, "Russian Satellites Have Been Jamming GPS Signals Across Europe, Scientists Say," *New York Times*, June 5, 2026, https://www.nytimes.com/2026/06/05/world/europe/russia-satellites-gps-interference-europe.html

[126] Commission Delegated Regulation (EU) 2017/574 of 7 June 2016 supplementing Directive 2014/65/EU (MiFID II) with Regard to Regulatory Technical Standards for the Level of Accuracy of Business Clocks (RTS 25), article 2.

observed, a satellite jammer could "selectively jam an entire continent every day."[127]

The point is merely that the supply side is, almost by definition, ultimately physical. And that, in turn, raises questions about the importance of military force and other ways of protecting physical space.

Section VI: Conclusions

Richard Nixon confessed in the early 1970s that he had become a Keynesian in economics. Fifty-five years later, the confession due today is that we all should be supply siders now—and, more precisely, *geopolitical* supply siders. A generation of globalization built supply chains that were long and concentrated enough that Kremer's O-ring logic now operates at the scale of the world economy. The preceding sections have argued that the macroeconomic variance present in this global system now mostly originates on the supply side, in shocks that increasingly begin in politics, travel through production networks with long lags, and are amplified by concentrated chokepoints.

Three features of this new era have emerged, each one heightening the need to update our inherited framework. First, the supply side is at once less elastic, disturbed more often and for reasons beyond the narrow economic frame, and wired through networks that amplify them. Second, they propagate through networks with long and uneven lags: delivery delays, then input shortages, then margin compression, then price pass-through, unwinding on the supply disruption's schedule rather than the demand cycle's. That is why inflation analysis has become, at its core, the tracking of lags. Third, demand has not disappeared as a source of fluctuation so much as it has been attenuated: markets now expect that when demand wavers, the policy reaction function stands ready to respond, while the AI buildout continues to cushion.

The implications of these features are profound. For monetary policy, a world of supply-driven inflation is one in which central banks necessarily must assess and even predict geopolitics. For statecraft, chokepoints have become instruments: usable where leverage is credible, self-defeating where it is not, and always at risk of accelerating the substitution they are meant to prevent. For policy more broadly, the answer to concentrated vulnerability is not self-reliance—which merely trades a foreign chokepoint for a domestic one—but diversified abundance: creating more capacity, spread across more suppliers, geographies, and routes, and deliberately redundant rather than simply larger. And for firms, the same forces that raise aggregate variance are widening the dispersion of outcomes within industries. When shocks arrive through specific nodes rather than through aggregate demand, position in the network matters more than exposure to the cycle—

[127] Riley Mellen and Eric Schmitt, "Russian Satellites Have Been Jamming GPS Signals Across Europe, Scientists Say," *New York Times*, June 5, 2026, https://www.nytimes.com/2026/06/05/world/europe/russia-satellites-gps-interference-europe.html

which is why the capacity we have called contextual alpha is becoming a source of durable advantage.

The supply side that has returned does not fit nicely into a narrow model of the economy. Its shocks begin in ministries and militaries, travel through logistics networks and balance sheets, and surface in price indices months or years later. Seeing and responding to supply shocks, even as the overall variance of individual supply shocks has narrowed, require reading macroeconomic, geopolitical, regulatory, and sector-specific forces together while calibrating models to capture the cascading impacts of supply disruptions. If contextual alpha is the ability to consider macroeconomic, geopolitical, regulatory and sector-specific forces not as independent variables but as part of an interconnected system, the institutions that cultivate it by refusing to silo these questions will hold a durable advantage. The economists of the postwar era earned their influence by mastering demand; the task now is to build the same rigor around supply in its new political form. The next supply shocks will not respect our departmental boundaries, and we must look further and more broadly to anticipate them and their system-wide effects.