GLOBAL ECONOMICS ANALYST

Higher Natural Gas Prices, Slightly Larger Economic Headwinds

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- Oil prices have risen sharply due to the war in Iran, but liquified natural gas (LNG) prices have risen even more sharply (and remain elevated under our commodity forecasts) due to the disruption of Qatar's supply and damage to its infrastructure. For countries that rely on LNG, this outsized price response suggests rising energy prices will have a larger impact on inflation and activity than oil prices alone would suggest.
- The rise in gas prices will impact inflation through three distinct channels. First, higher gas prices will directly increase costs for natural gas consumed by households, with impacts depending on energy composition and domestic utility passthrough rates. Second, higher gas prices will raise household electricity prices, with statistical estimates pointing to a 25% passthrough rate on the share of electricity produced with gas. Third, higher gas prices will raise producer costs, thereby leading to downstream boosts to core inflation.
- Combining our estimates from each of these channels, we estimate that a 10% increase in natural gas prices (separate from other energy price increases) raises global headline inflation by 8bp. After merging these estimates with our standing oil-price impulses, we estimate that the war in Iran will raise global inflation by 0.8% (vs. 0.7% based on oil price increases alone). Risks are skewed toward larger increases if the Strait of Hormuz remains shut for longer.
- The outsized gas price increase also implies downside to our standard growth estimates, both because higher inflation boost will add to the spending headwind, and because higher gas prices will create headwinds to industrial production. We estimate that each 10% natural gas price increase (separate from other energy price increases) lowers GDP by 0.04% globally with larger effects in Europe. After updating our standard growth rules of thumb, we now estimate a 0.5% drag on global GDP in 2026 (vs. 0.4% based on oil price increases alone).
- Discretionary policy measures (which are embedded into our country economic teams' forecasts) may limit the economic impacts of higher energy prices. That said, our estimates suggest that the outsized increase in global LNG prices will lead to a slightly larger-than-normal impact on global growth and inflation.

Higher Natural Gas Prices, Slightly Larger Economic Headwinds

Energy prices have risen sharply due to the closure of the Strait of Hormuz, which our commodity strategists assume will remain closed until mid-April. Under this baseline assumption, we expect that Brent will average $90/bbl in Q2 before gradually declining to $80/bbl in Q4. Our commodity strategists similarly expect that the disruption to Qatar's LNG exports (19% of global supply) will lift European natural gas (TTF) and global LNG (JKM) prices, which we expect will respectively average $16.90/mmBtu and $18.15/mmBtu in Q2 before declining to $13.65 and $14.65 by Q4. Risks are skewed toward worse outcomes and higher prices.

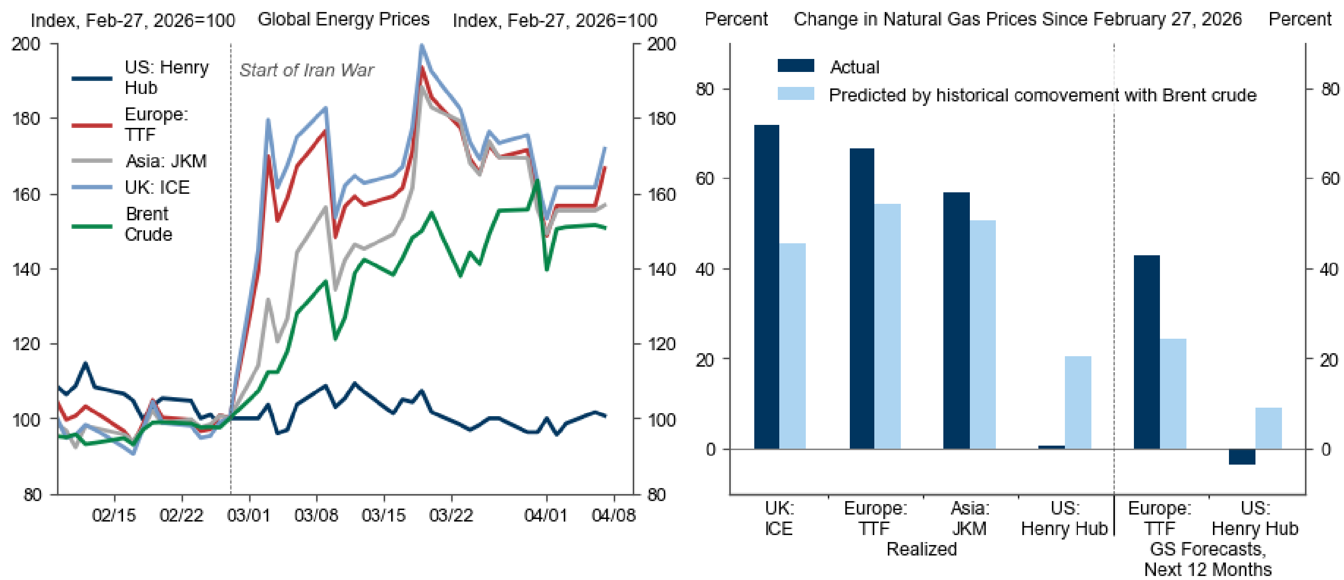
When analyzing the economic impact of higher energy prices, we have leaned on our standard oil rules of thumb which imply that each 10% increase in oil prices lowers global growth by a bit more than 0.1pp and raise headline inflation by a bit more than 0.2pp. Under our baseline oil forecasts, these rules imply that the energy price shock will add 0.7pp to global headline inflation (with a smaller 0.2pp impact on core inflation) and lower GDP growth by 0.4pp over the next year (excluding the larger impact on GDP growth in the Middle East itself).

Our oil-price rules of thumb will also capture the effects of broader energy price increases if non-oil energy prices shift in a manner consistent with historical patterns, as oil serves as a proxy for overall energy. But the left chart of Exhibit 1 shows that natural gas prices have risen much more sharply than oil prices in Europe and Asia (but have remained contained in the US due to the reliance on less easily exported domestic supply).[1] The right chart shows that the sharp increase in gas prices in Europe and Asia is larger than historical oil price moves would imply.

Furthermore, the outsized LNG price response relative to oil prices persists under our commodity team's baseline forecasts due to more rigid supply dynamics, less spare capacity prior to the conflict, permanent damage to Qatar's infrastructure, and the need for larger risk premia as LNG importers ramp up demand to build inventories ahead of next winter.

[1] Our Asian economic team's forecasts factor an outsized increase in Asian oil prices (captured by a $20 spread onto Brent that declines over time) to reflect Dubai vs brent futures.

Exhibit 1: Natural Gas Prices Have Increased in Europe and Asia but Held Steady in the US



Source: Haver Analytics, Goldman Sachs Global Investment Research

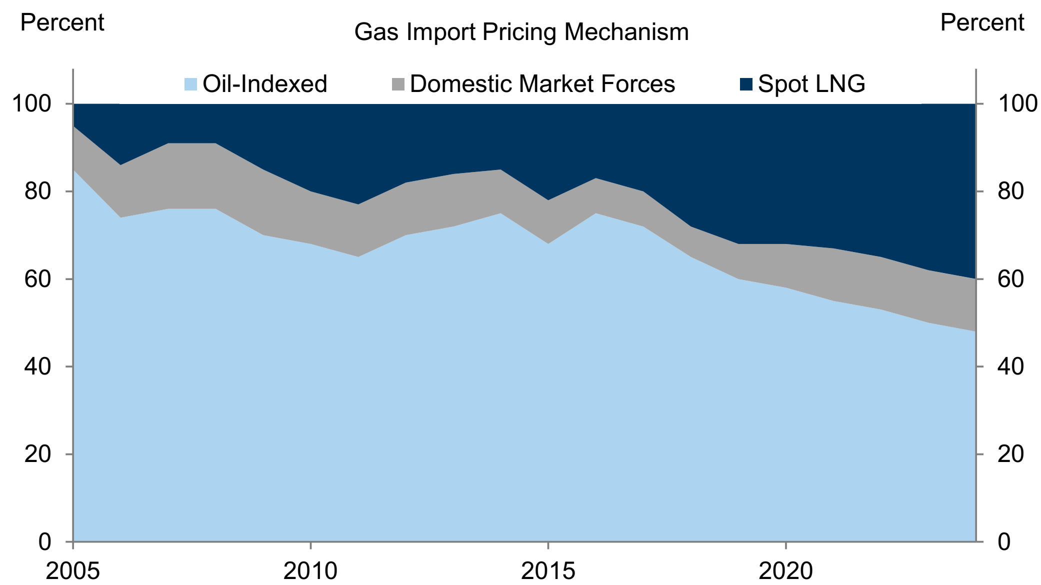
On their own, the outsized natural gas price response suggests rising energy prices will have a larger impact on inflation and activity than the historical patterns and statistical estimates which inform our oil-based rules of thumb would suggest. We see additional (structural) reasons why the economic impacts of higher natural gas prices are larger today.

First, the natural gas share of overall primary energy has drifted up over time—its global share has increased to 23.6% today from 20.1% in 1990, driven by an increase to 31.7% from 20.4% in high-income countries—suggesting estimates on historical data might understate exposures.

Second, LNG markets have expanded over the last decade, leaving domestic prices in several economies (particularly Europe and Asia) more exposed to global supply shocks.

Third (and related to the expansion of the global LNG market), natural gas pricing has moved away from crude-indexed contracts (again, particularly in Europe and Asia and particularly after the natural gas shortages in 2022) and become more sensitive to spot LNG price changes (Exhibit 2).

Exhibit 2: Traded Gas Has Shifted from Oil-Indexed to Spot LNG Pricing Mechanisms



Source: International Gas Union, Goldman Sachs Global Investment Research

The historical linkage between gas and oil prices and changes in natural gas markets make it difficult to statistically estimate the economic impacts of natural gas price changes separate from broader energy (specifically oil) prices. Estimates based on regimes where oil-indexing was more common will overstate the oil-gas relationship today, while historical estimates may understate the economic impacts given the LNG market growth over the last 10 years.

In this *Global Economics Analyst,* we therefore take an exposure-based approach to assess the incremental impacts of recent gas price changes. We first quantify the exposures of inflation and activity to natural gas for global economies. We then estimate the impacts of price changes on inflation and GDP based on our own and historical estimates of passthrough rates. Finally, we update our global rules of thumb to quantify the incremental economic impacts of natural gas price changes under our natural gas analysts' forecasts.

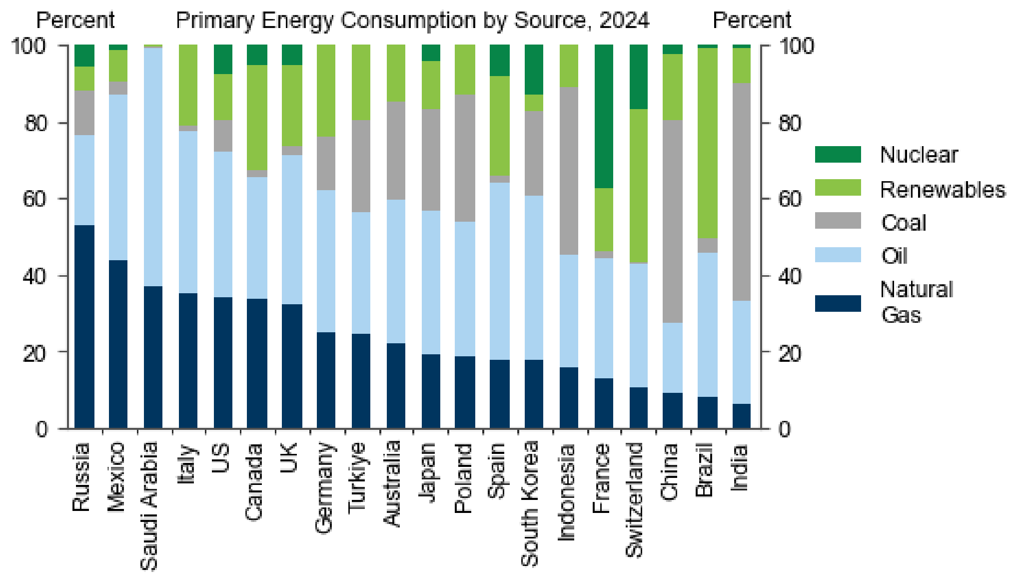
Our estimates suggest that the outsized increase in global LNG prices will lead to a somewhat larger-than-normal impact on global growth and inflation from the recent energy price increase, particularly in Europe.

Energy Usage Varies Across Economies

Before quantifying the effects of natural gas on growth and inflation, we first note that the impact of changes in natural gas prices across countries will depend on several distinct factors (see Appendix Exhibit 1 for a summary).

First, the composition of energy consumption varies widely across economies, as summarized in Exhibit 3. In particular, natural gas is a more important source of primary energy for countries in the Middle East, Southeast Asia, and Europe.

Exhibit 3: The Composition of Energy Consumption Varies Across Economies



Source: Haver Analytics, Goldman Sachs Global Investment Research

Second, the economic impacts will potentially be larger for countries in Europe and Asia that are not domestic producers and more reliant on imported LNG as the source of marginal gas supply. In contrast, the US, Canada, and Australia are self-sufficient and prices are determined locally, so impacts should be much smaller.

Third, natural gas prices are mostly determined at a local level and price formation varies across economies. For instance, in Europe gas prices are benchmarked to TTF prices which are in turn determined by global LNG market supply and demand. In most ASEAN economies, prices are benchmarked to the Japan Korea Marker (JKM) which is also determined by the global LNG market, but governments are more active in regulating prices.

Fourth, while in most DM economies the passthrough of wholesale price increases to consumers and businesses is determined by market forces—with the merit order principle leaving natural gas as the marginal energy source that is most relevant in setting price—in many EM economies domestic prices are either controlled by the government (e.g., China) or regulated via price caps and subsidies (e.g., much of Asia and LatAm), which should limit the immediate economic impacts.

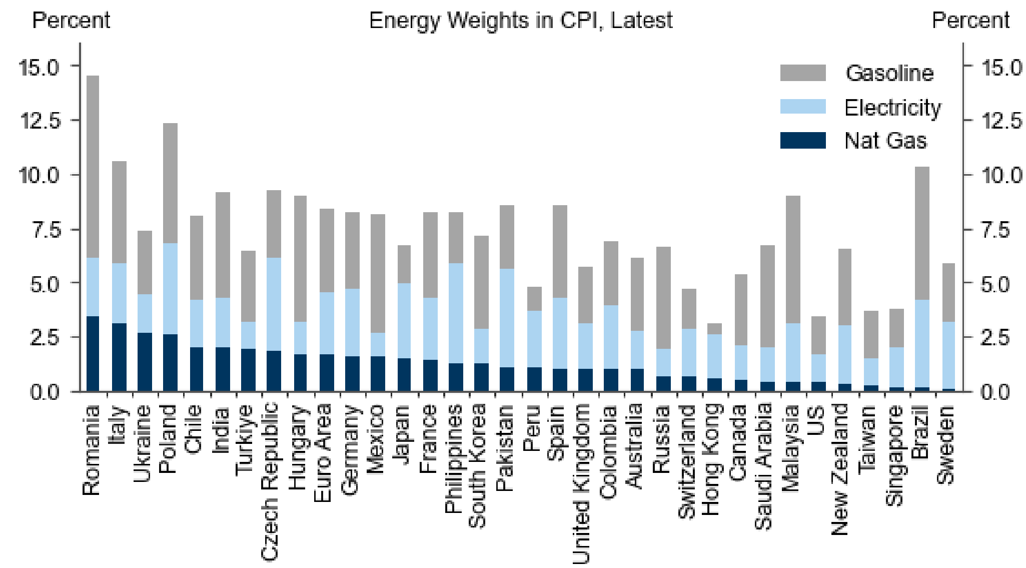
Inflation Impacts

Higher gas prices will pass through to inflation via three distinct channels.

First, higher gas prices will directly increase the price of natural gas consumed by households, with the overall impact determined by the gas share in the household consumption basket and the passthrough from higher wholesale prices to retail prices.

Exhibit 4 compiles energy weights in the headline CPI basket for different economies under our coverage, broken out across gasoline, electricity, and natural gas. Natural gas accounts for a small share of energy consumption in most economies, but 1-3% of the CPI headline basket in Europe and 1-2% of inflation in several Asian EMs.

Exhibit 4: Household Exposure to Natural Gas is Notable in Europe and Some Asian EMs, but More Modest Elsewhere

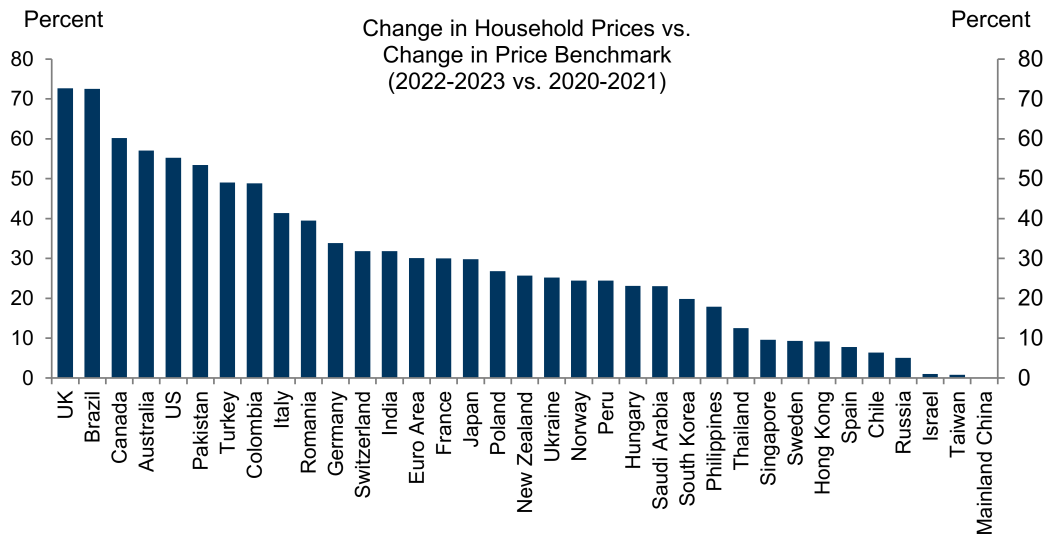


Source: Haver Analytics, Goldman Sachs Global Investment Research

Estimating the pass-through from higher natural gas prices to headline inflation varies widely based on domestic price-setting conventions. Using the change in natural gas prices in 2022-23 (vs. 2020-21 average) relative to the relevant pricing benchmark as a proxy (Exhibit 5), we find that pass-through rates ranged from 40-70% for economies where wholesale and retail gas prices are mostly determined by market forces (e.g., Western Europe, North America, and Australia/New Zealand), by 20-40% in economies where prices are more heavily regulated (e.g., many economies in LatAm, Central Europe, and East Asia), and by less than 20% in economies where prices are more rigidly controlled by the government (e.g., Mainland China, Taiwan).

While the 2022-2023 experience was unusual given the sudden loss of supply, based on these patterns we assume a 70% pass-through rate in economies where prices are mostly determined by market forces but smaller passthrough rate (30%) in economies where prices are more heavily regulated or government controlled (10%).

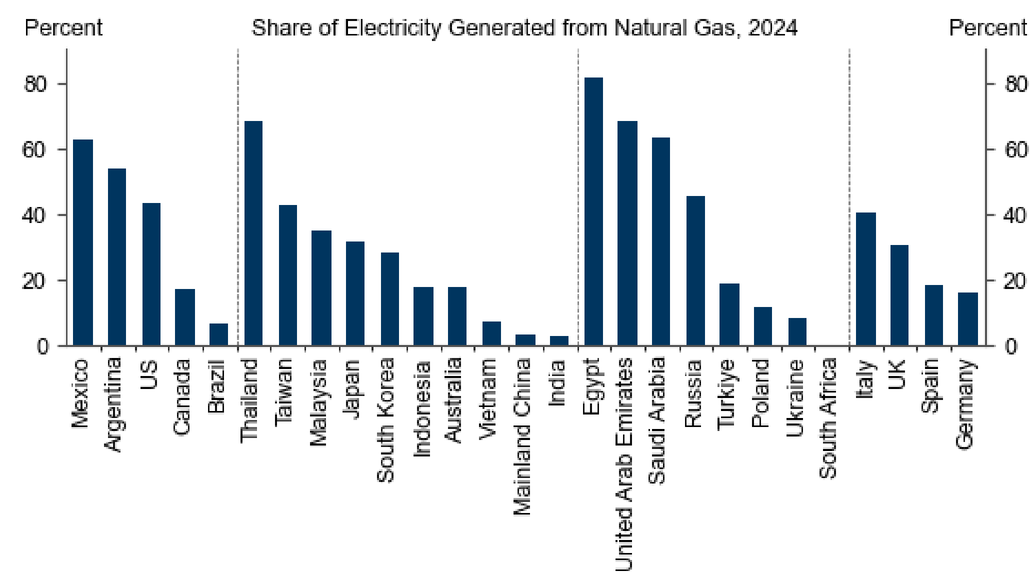
Exhibit 5: Pass Through Rates Are Smaller in Economies Where Prices Are Regulated or Controlled by the Government



Source: Haver Analytics, Goldman Sachs Global Investment Research

Second, higher gas prices will raise household electricity prices, with the impact again depending on the share of electricity generated from natural gas and the pass-through to consumer electricity prices. Exhibit 6 shows the share of electricity generated by natural gas in different economies under our coverage. The key takeaway from this chart is that there is significant heterogeneity across economies (including within regions), with several LatAm, East Asian, and Middle Eastern economies most highly exposed.

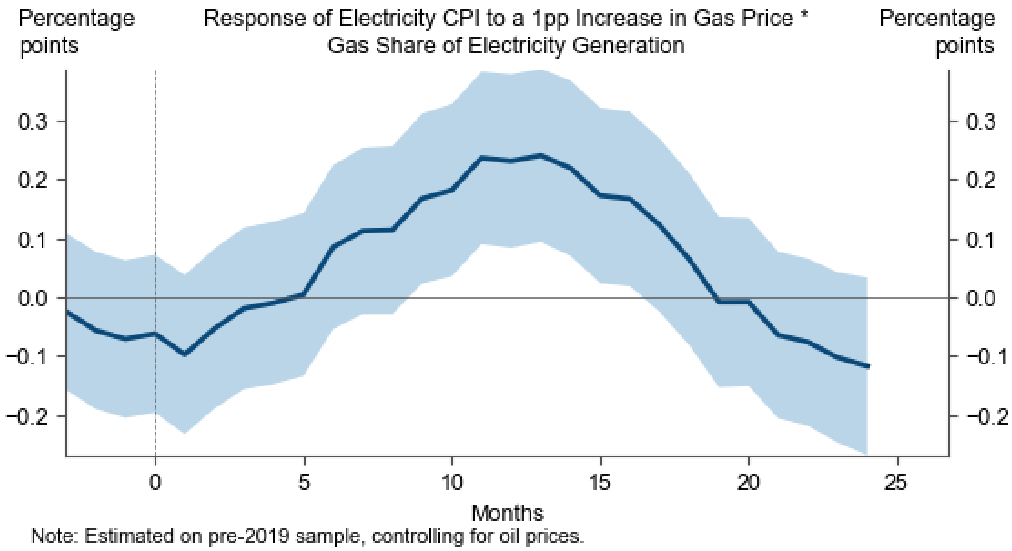
Exhibit 6: Electricity Prices Could Rise Due to Natural Gas Price Increases



Source: Haver Analytics, Goldman Sachs Global Investment Research

To estimate the pass-through from natural gas to electricity prices, we use a country-panel and regress the country-specific electricity CPI price index on the change in the relevant natural gas price benchmark interacted with the gas share of overall electricity. The resulting coefficient—which reflects the passthrough rate on the share of electricity produced gas—implies a 25% passthrough rate with a 1-year lag. The lag reflects that electricity companies are mostly regulated utilities with rates subject to approval, while the incomplete passthrough reflects the ability of electricity companies to offset higher natural gas prices by switching between alternative sources of power.

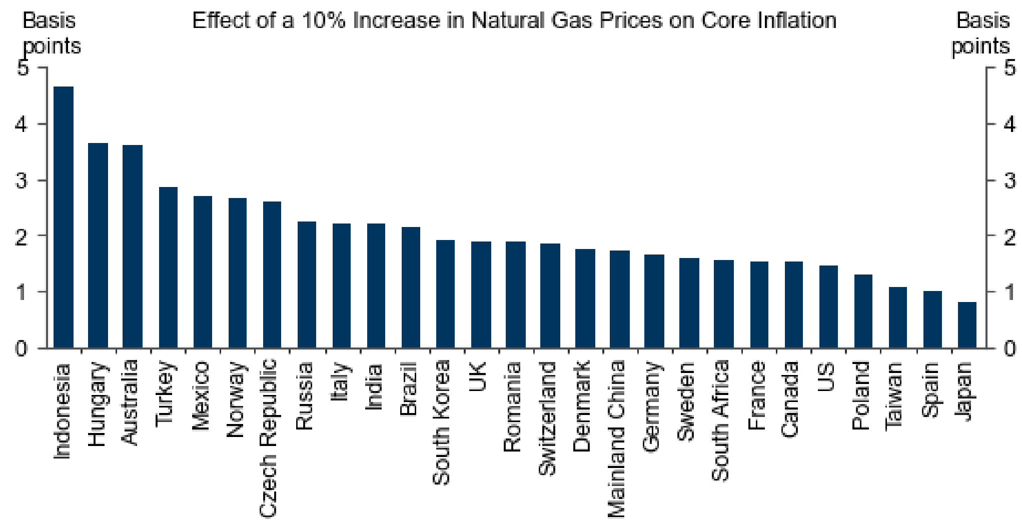
Exhibit 7: Gas Prices Pass Through to Electricity with a Lag



Source: Haver Analytics, Goldman Sachs Global Investment Research

Third, higher gas prices will raise producer costs, thereby leading to downstream pressure on core inflation. To estimate the impact on core inflation, we first use the EXIOBASE world-input output tables to trace the contribution of natural gas to non-energy household spending. We then assume, consistent with our prior research, that 40% of the natural gas price increase is passed through to household prices (with the rest absorbed by producers via lower margins). Our resulting estimates imply that each 10% increase in natural gas prices raises core inflation by 1-5bp, with larger effects in Europe and Asian EMs (Exhibit 8).

Exhibit 8: A 10% Increase in Natural Gas Prices Implies a 1-5bp Boost to Core Inflation in Most Economies

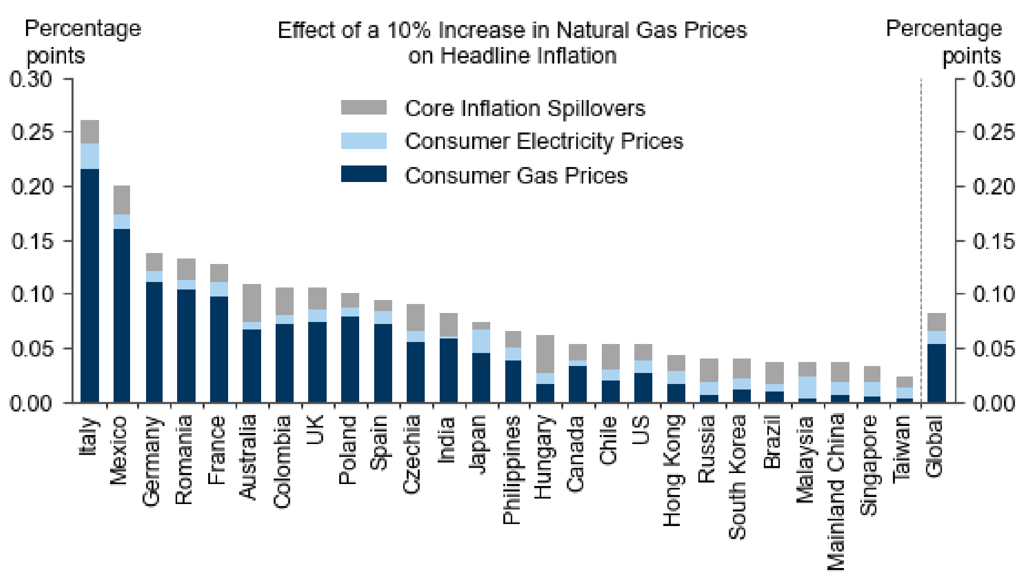


Note: We assume that 40% of cost increases due to higher gas prices are passed on to consumers.

Source: EXIOBASE, Goldman Sachs Global Investment Research

Exhibit 9 combines these three channels to estimate the boost to headline inflation from a 10% increase in natural gas prices. Our estimates suggest that each 10% increase in the economy-specific wholesale price benchmark raises headline inflation by 8bp—with larger effects in Romania, Italy, and Poland and smaller effects in economies like Taiwan, Russia, and Mainland China where gas prices are managed by the government—with most of the effect driven by the direct exposure from household energy consumption.

Exhibit 9: A 10% Increase in Natural Gas Prices Raises Global Headline Inflation by 8bp According to Our Estimates



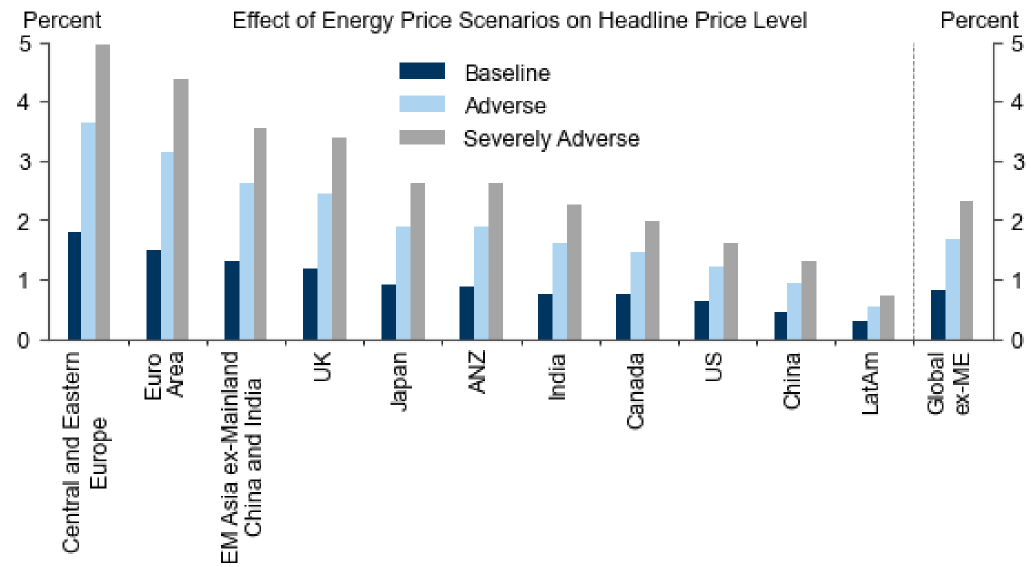
Source: Goldman Sachs Global Investment Research

As discussed above, the impact from higher natural gas prices is largely captured by our standard estimates of the impact of oil price changes on headline inflation via the correlation between natural gas and energy prices. That said, today's divergence in natural gas and oil prices from their historical relationships (shown in Exhibit 1) suggests that the capture is incomplete.

To adjust our standard estimates for the differential gas price increases due to the war in Iran, we combine our standard oil price rules of thumb with the differential natural gas price impact in the current situation. We estimate the incremental natural gas price impact by multiplying the difference between our commodity team's natural gas price forecasts and natural gas counterfactual implied by our oil price forecasts (Exhibit 1) with the natural gas rules of thumb shown in Exhibit 9.

These augmented estimates point to a 0.8pp uplift to global headline inflation under our baseline forecast assumptions for a 6-week closure of the Strait of Hormuz. This Increase is slightly higher than the 0.7pp increase implied by our standard oil-price rules of thumb, mostly reflecting larger increases in Central and Eastern Europe, the Euro Area, EM Asia (ex China and India), and Japan. In an adverse scenario (where the Strait of Hormuz remains shut until mid-May) and severely adverse scenario (where the Strait remains for longer and there is more significant damage to energy infrastructure), we would expect larger boosts to global headline inflation of 1.7pp and 2.3pp (mostly due to the broader increase in oil and energy prices).

Exhibit 10: Our Augmented Rules of Thumb Imply a 0.8% Increase in Global Headline Inflation, With Upside in More Adverse Scenarios



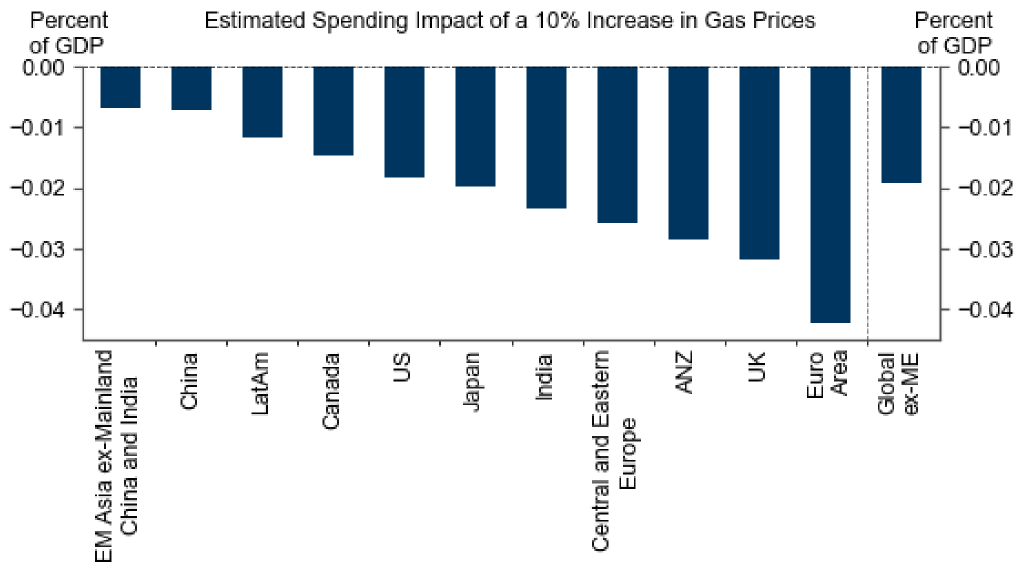
Source: Goldman Sachs Global Investment Research

GDP Impacts

The outsized gas price increase also implies downside to our standard growth estimates via incremental inflation headwinds to spending and cost headwinds to industrial production.

To estimate the impact on spending, we combine our estimates of the boost to inflation from a 10% increase in natural gas prices (Exhibit 9) with our standard assumption that each 1pp increase in inflation lowers real consumer spending by 0.5pp. We then multiply by the consumption share of GDP to estimate the overall growth hit. These estimates, shown in Exhibit 11, imply a 2bp drag on global growth for each 10% increase in natural gas prices (separate from broader oil price impacts).

Exhibit 11: The Boost to Inflation From a 10% Increase in Natural Gas Prices Lowers Global Consumer Spending by 2bp, According to Our Estimates



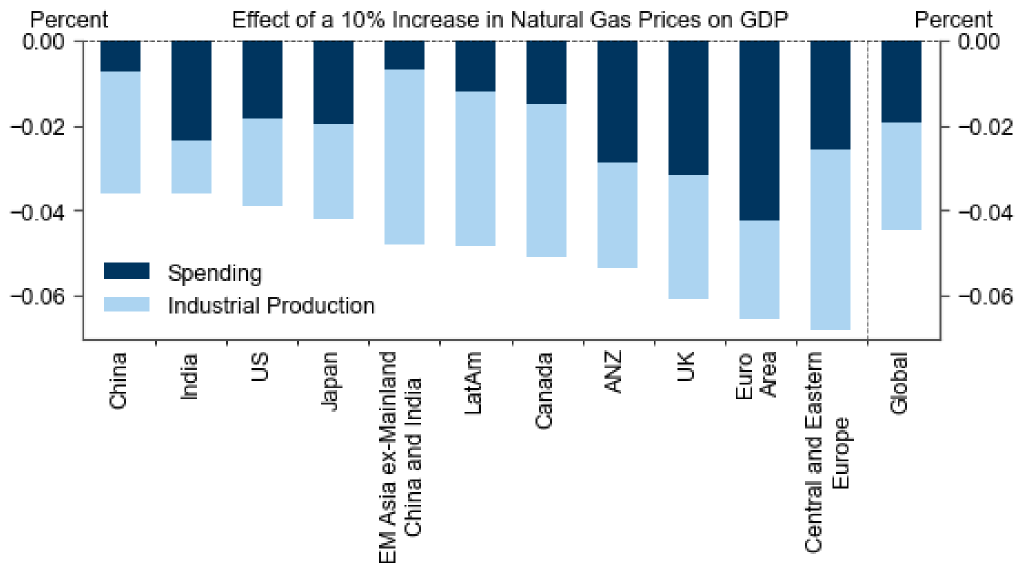
Source: Goldman Sachs Global Investment Research

To size the headwind to industrial production from higher gas prices, we first survey academic literature. Studies on the impact of natural gas price changes specifically (as opposed to broader energy prices) mostly focus on two episodes. First, a recent body of research uses the 2022 gas crisis in Europe to estimate that a 10% increase in natural gas prices lowers industrial production by around 0.7%. Second, studies use the decline in natural gas prices during the US shale boom and find smaller impacts, estimating that a 10% decline in gas prices boosted US industrial production by around 0.3%.

Given the limited academic evidence (and lack of estimates for most economies in our coverage), we rely on estimates of broader energy price effects on industrial production to size the impact of higher gas prices on industrial output. We first leverage shocks from Känzig (2021) to estimate a panel regression that identifies elasticity of industrial production to broader energy prices. We then combine this estimated elasticity with the country-specific natural gas share of energy consumption and industrial production share of GDP to estimate the hit to output from a 10% increase in natural gas prices. Our estimate implies that a 10% increase in natural gas prices (in isolation of broader energy price changes) lowers global GDP by a bit over 0.02% via industrial headwinds.

Exhibit 12 combines our estimates of the headwind to consumer spending and industrial production to estimate the drag on growth from a 10% increase in natural gas prices. We estimate that each 10% increase in natural gas prices lowers global GDP by 0.04%.

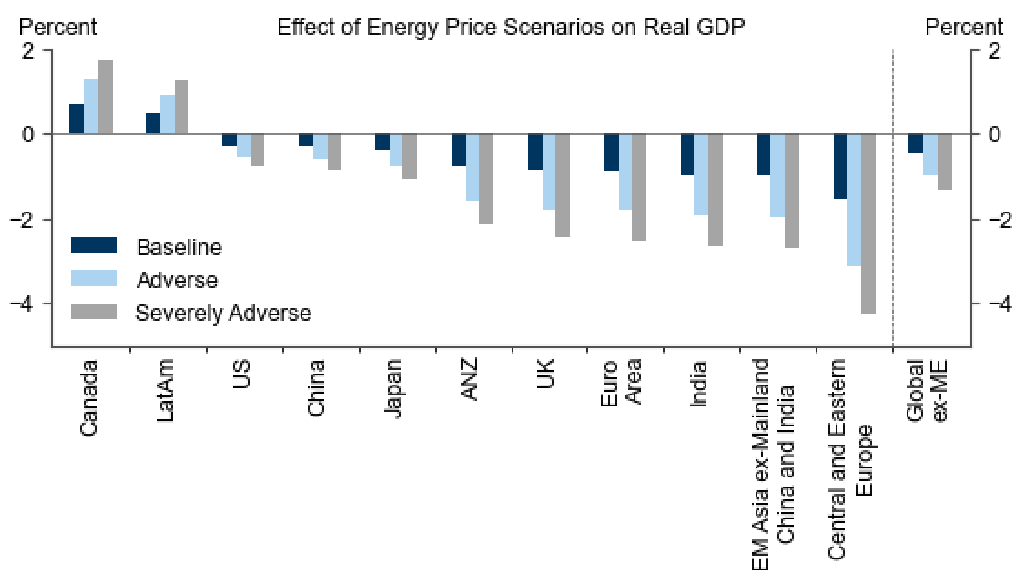
Exhibit 12: A 10% Increase in Natural Gas Prices Lowers Global GDP by 0.04%



Source: Goldman Sachs Global Investment Research

Exhibit 13 uses our estimated natural gas price growth drag (Exhibit 12) to adjust our oil price-to-growth rules of thumb to account for the outsized increase in gas prices and update our estimates of the drag on growth due to the war in Iran. Our augmented estimates point to a 0.5% drag on global GDP in 2026 (vs. 0.4% under our standard oil-price rules of thumb) under our baseline assumptions regarding reopening of the Strait of Hormuz. The hit to global GDP would rise to around 1.0% in our adverse scenario for a longer closure and 1.3% in a severely adverse scenario where infrastructure is also damaged.

Exhibit 13: Our Updated Estimates Imply a 0.5% Drag on Global GDP Due to the War in Iran, With Downside in More Adverse Scenarios



Source: Goldman Sachs Global Investment Research

Other Considerations

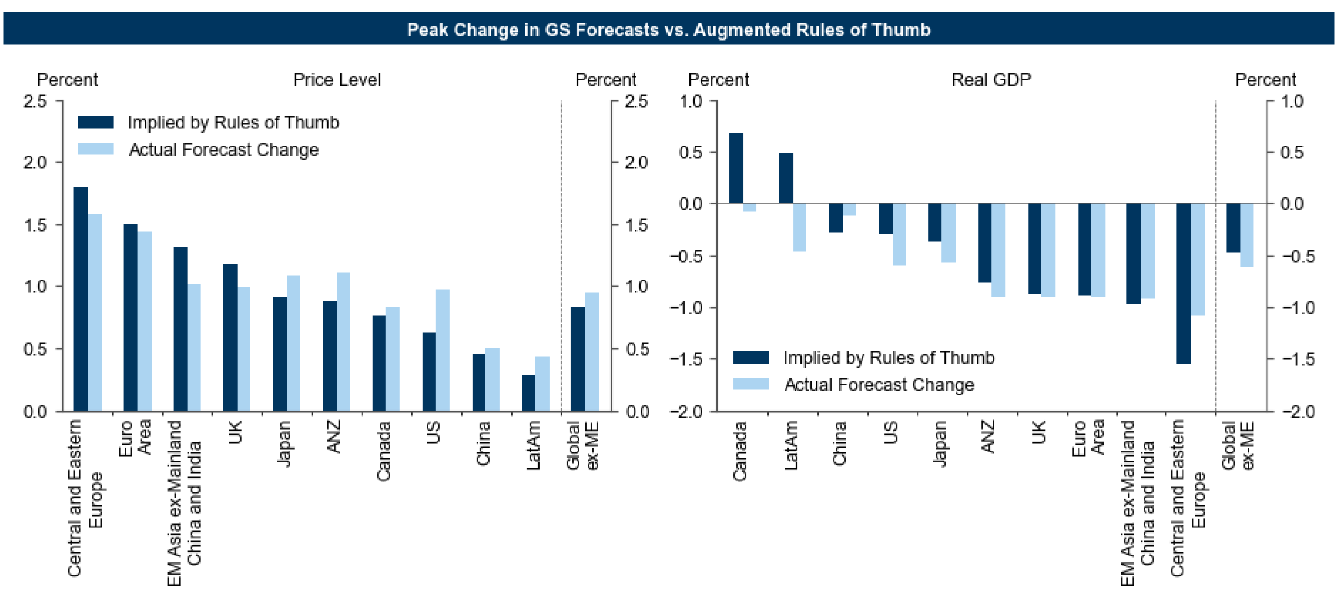
A limitation to our accounting-based approach is that we do not account for discretionary policy changes that might limit the economic impacts of higher natural gas prices. To the extent that governments decide to offset higher natural gas prices, the impacts could arrive as a deterioration in fiscal balances rather than the near-term economic impacts highlighted above. Likewise, our analysis focuses on the impacts of higher prices rather than the outright shortages that could emerge if global LNG supply is restricted for much longer than we expect. We also do not consider the FX implications of an outsized natural gas price shock, which could lead to differential effects on terms of trade and inflation.

To highlight these other considerations, Exhibit 14 compares the changes in our country-team's headline inflation and GDP forecasts (which do factor in these considerations) with our top-down estimates. There is a strong positive correlation between our top-down and bottom-up estimates and the implied overall global impacts similar. But there are a few differences.

On inflation, our actual forecast upgrades have been somewhat smaller than our top-down estimates would suggest in Central Europe and Asia, largely reflecting an expectation that policy interventions will limit consumer price increases. In contrast, our forecast upgrades have been larger than our top-down estimates would imply in the US, reflecting our forecast for higher food prices and modest boosts to core inflation from non-energy supply disruptions.

On GDP, our actual growth forecast changes for Canada and LatAm are muted relative to our top-down estimates, reflecting that the increase in capex we would normally expect from higher oil prices is unlikely to materialize given the transitory nature of the energy price shock. Elsewhere, our top-down estimates and actual growth forecast changes are similar.

Exhibit 14: Our Actual Forecast Changes Are Highly Correlated with Our Top-Down Estimates, with Differences Mostly Reflecting Discretionary Policy Responses



Source: Goldman Sachs Global Investment Research

Our takeaway from this analysis is that the shutdown of the Strait of Hormuz and its outsized impact on global LNG prices will have a significant impact on the economic outlook, with a slightly larger impact on inflation and growth than historical estimates based on oil prices alone would suggest. The larger impact from LNG will be especially important to monitor if a longer closure of the Strait of Hormuz (or more gradual reopening) puts incremental upward pressure on LNG prices.

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Appendix

Appendix Exhibit 1: The Impact of Changes in Natural Gas Prices Across Economies Will Depend On the Pricing Regime

Economy	Domestic Production Share (%)	Marginal Supply from LNG?	Gas Pricing Regime	Price Benchmark	Residential Retail Pricing	Industrial Retail Pricing
United States	110	No	Liberalized	Henry Hub	Market based, price changes regulated	Market based
Canada	115	No	Liberalized	Henry Hub	Market based, price changes regulated	Market based
Mexico	38	No	Hybrid	Henry Hub	Government controlled	Market based, price changes regulated
Brazil	73	Yes	Hybrid	Henry Hub	Government controlled	Hybrid regulated
Colombia	93	No	Regulated	Government set	Government controlled	Government controlled
Chile	13	Yes	Liberalized	Henry Hub	Market based	Market based
Argentina	98	Yes	Regulated	Government set	Government controlled	Government controlled
Euro Area	11	Yes	Liberalized	TTF	Market based (varies; some temporary caps)	Market based (varies; some temporary caps)
United Kingdom	48	Yes	Liberalized	UK NBP	Market based, price changes regulated	Market based
Poland	28	Yes	Hybrid	TTF	Government controlled	Market based, price changes regulated
Czech Republic	2	No	Liberalized	TTF	Market based	Market based
Hungary	18	No	Regulated	Government set	Government controlled	Hybrid regulated
Romania	80	No	Hybrid	TTF	Hybrid regulated	Hybrid regulated
Russia	100	No	Regulated	Government set	Government controlled	Government controlled
Israel	100	No	Regulated	Government set	Government controlled	Government controlled
Egypt	93	No	Regulated	Government set	Government controlled	Government controlled
Mainland China	57	Yes	Hybrid	JKM	Government controlled	Hybrid regulated
India	48	Yes	Hybrid	JKM	Government controlled	Hybrid regulated
Japan	3	Yes	Liberalized	JKM	Market based, price changes regulated	Market based
Malaysia	105	No	Regulated	Government set	Government controlled	Government controlled
Hong Kong	0	Yes	Regulated	JKM	Hybrid regulated	Hybrid regulated
Singapore	0	Yes	Liberalized	JKM	Market based	Market based
Taiwan	2	Yes	Regulated	JKM	Government controlled	Government controlled
South Korea	1	Yes	Regulated	JKM	Government controlled	Government controlled
Vietnam	75	Yes	Regulated	Government set	Government controlled	Government controlled
Philippines	55	Yes	Hybrid	JKM	Hybrid regulated	Hybrid regulated
Australia	200	No	Liberalized	Domestic contract	Market based, price changes regulated	Market based
New Zealand	85	No	Liberalized	Domestic contract	Market based	Market based

Source: Goldman Sachs Global Investment Research

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Disclosure Appendix

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Unless otherwise stated, the individuals listed on the cover page of this report are analysts in Goldman Sachs' Global Investment Research division.

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