Data and Policy Summer Scholar Program 2022
Harris School of Public Policy, The University of Chicago

Capstone Project: Macroeconomic Shocks and Consumer Spending

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Executive Summary

This policy memorandum uses consumption data from data aggregator SafeGraph to analyse how the global economic response to the Russian invasion of Ukraine has impacted spending patterns in the United States (US). It makes the following stylised observations:

- For the period of February 1 – March 31, 2022, apart from a sharp but temporary fluctuation in retail spending on February 21 when US and EU sanctions were enacted, the Russo-Ukraine war had no persistent effect on retail spending.
- For the period of February 17 – March 3, 2022, to the extent that retail spending changed, the magnitude of change varied by geography (using county-level data in the state of California as a case study).
- For the latter period, there was no significant correlation between the change in spending on gasoline by county and that on all other goods and services, regardless of whether state fixed effects are included.

This memorandum concludes the following:

- Despite its military and geopolitical significance, the Russian invasion of Ukraine is not a long-term driver of retail spending. To boost household consumption, the current administration should focus on addressing other economic distresses, such as Covid-19 related supply-chain disruptions or demand-side pressures from a hitherto permissive Federal Reserve policy.
- The same exogenous shock to retail spending will affect US households differently, depending on geographic location. It may be prudent to introduce more surgical state and county-level policies to raise retail spending, in conjunction with broad-based federal programs. Disbursing federal funds to state officials to implement policies most appropriate to their spending profile might be a more efficient method of raising retail spending in certain categories.
- Categories of retail spending like gasoline, which affect a large number of US households, should be a priority for policymakers.
- As a policymaker, it is difficult to extrapolate how changes in gasoline prices or spending will impact spending in other retail categories, as they are not significantly correlated.

Introduction

On February 21, 2022, US President Joseph R. Biden Jr. signed into effect Executive Order 14065, in response to Russia's recognition of sovereignty in the Donetsk and Luhansk separatist regions in Ukraine.[1] The order enacted sanctions on trade, investment and financing against the breakaway provinces and was enjoined by the European Union, which imposed travel bans and asset freezes on five new individuals.[2] These were followed by a further array of sanctions after Russian President Vladimir Putin declared war on Ukraine on February 24, 2022, initiating a multi-frontal assault towards Kyiv, Kharkiv, Odesa, Zaporizhzhia, and Mariupol.[3,4] Into its sixth

[1] "Blocking Property of Certain Persons and Prohibiting Certain Transactions With Respect to Continued Russian Efforts To Undermine the Sovereignty and Territorial Integrity of Ukraine," U.S. Department of the Treasury, last modified February 23, 2022, https://home.treasury.gov/system/files/126/14065.pdf.
[2] "Russia's war on Ukraine: A sanctions timeline," Peterson Institute of International Economics, last modified September 2, 2022, https://www.piie.com/blogs/realtime-economic-issues-watch/russias-war-ukraine-sanctions-timeline.
[3] "Missiles rain down on Ukraine," Reuters, last modified February 25, 2022, https://www.reuters.com/world/europe/putin-orders-military-operations-ukraine-demands-kyiv-forces-surrender-2022-02-24.
[4] "Russia's Ill-Fated Invasion of Ukraine: Lessons in Modern Warfare," Center for Strategic & International Studies, last modified June 1, 2022, https://www.csis.org/analysis/russias-ill-fated-invasion-ukraine-lessons-modern-warfare.

month, the invasion has had palpable economic consequences globally. The Russo-Ukraine region exports vital commodities, including 30% of global exports of wheat, 14% of the global crude and condensate oil output, and 40% of European Union gas demand in 2021.[5,6] Punitive financial and trade sanctions, such as Russian banks' removal from the global SWIFT payment system, have further hamstrung the flow of capital, goods and services. These developments have exacerbated supply-chain disruptions inherited from intermittent Covid-19 related lockdowns since early 2020, driving 2022's global Consumer Price Index (CPI) inflation estimates up to 7.7%.[7]

The US is not immune from price rises. The Bureau of Labour Statistics measured a year-on-year CPI increase of 8.5% across all items, 10.9% for food, and 32.9% for energy for July 2022.[8] The current Biden administration has attributed higher prices to the Russian invasion, proceeding as far as to term the phenomenon 'Putin's Price Hike'.[9] Standard economic theory indeed predicts that higher prices may dissuade consumers from spending by reducing real money and wealth balances.[10] However, it is prudent to consider macroeconomic pressures from other sources, which include: supply-chain restructuring due to the present pandemic; the inflationary effects of low interest rates and quantitative easing; trade disputes with China and other economies; or even underinvestment in hydrocarbons due to a policy preference for renewables.[11,12,13] This memorandum seeks to accomplish the isolate the impact of the Russian invasion of Ukraine on consumer spending, and propose preliminary policy recommendations based on its findings.

Data

This memorandum utilises a novel dataset from SafeGraph's Spend, which contains anonymized debit and credit card transaction data aggregated to individual places in the U.S.[14] It studies high-frequency consumer data from February 1 – March 31, 2022 across seven retail categories: Clothing Stores; Gasoline Stations; Grocery Stores; Traveller Accommodation; Department Stores; General Merchandise Stores including Warehouse Clubs and Supercenters; and Restaurants and Other Eating Places.

Analysis

A daily time series of consumer spending is first constructed by retail category, for the period February 1 – March 31, 2022.

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[5] "Global wheat shortage looms as summer risk over Ukraine war," Nikkei Asia, last modified March 31, 2022, https://asia.nikkei.com/Politics/Ukraine-war/Global-wheat-shortage-looms-as-summer-risk-over-Ukraine-war.
[6] "Energy Fact Sheet: Why does Russian oil and gas matter?" International Energy Agency, last modified March 21, 2022, https://www.iea.org/articles/energy-fact-sheet-why-does-russian-oil-and-gas-matter.
[7] Jarod Coulter and Enrique Martínez-García, "Russia's War on Ukraine Will Leave Scars on U.S., World Economies," Federal Reserve Bank of Dallas, last modified May 17, 2022, https://www.dallasfed.org/research/economics/2022/0517.aspx.
[8] "Consumer Price Index," U.S. Bureau of Labour Statistics, last modified August 10, 2022, https://www.bls.gov/cpi.
[9] "President Biden's Plan to Respond to Putin's Price Hike at the Pump," The White House, last modified March 31, 2022, https://www.whitehouse.gov/briefing-room/statements-releases/2022/03/31/fact-sheet-president-bidens-plan-to-respond-to-putins-price-hike-at-the-pump.
[10] Gregory Mankiw, Macroeconomics, 4th ed. (New York: Worth Publishers, 2019).
[11] Willy C. Shih, "Global Supply Chains in a Post-Pandemic World," Harvard Business Review, last modified October 2020, https://hbr.org/2020/09/global-supply-chains-in-a-post-pandemic-world.
[12] John H. Cochrane, "Why Hasn't the Fed Done More to Fight Inflation?" Chicago Booth Review, last modified April 27, 2022, https://www.chicagobooth.edu/review/why-hasnt-fed-done-more-fight-inflation.
[13] "Deepening Underinvestment in Hydrocarbons Raises Spectre of Continued Price Shocks and Volatility", International Energy Forum, last modified December 7, 2021, https://www.ief.org/news/deepening-underinvestment-in-hydrocarbons-raises-spectre-of-continued-price-shocks-and-volatility.
[14] "Spend," SafeGraph, last modified July 2022, https://docs.safegraph.com/docs/spend.

Fig. 1. Daily time series figure of spending by retail category, February 1 – March 31, 2022.

Tracking consumer spending across seven retail categories (Fig. 1), one can observe the following:

- A weekly cyclical pattern of consumption.
- The cycle consists of two upward swings – one crest on Fridays, and a larger crest on Mondays (the exception is Tuesday on February 22).
- Daily spending adheres to this pattern for all retail categories.

This pattern is likely due to a rise in spending on Fridays, the final day of the working week, and the weekend. Consumers may defer purchases to the Friday – Sunday period when more personal time is available, driving up retail spending on these days. Note that the date reported in the SafeGraph dataset is in fact the date a transaction is processed by a financial institution – the next business day. Reported spending on Monday thus reflects the true spending across Saturday, Sunday and Monday.

To control for this cyclical trend, daily spending is deseasonalised by day of week (Fig. 2). One can observe the following:

- There continues to be a weekly cyclical pattern of consumption observed in Fig. 1, albeit smoothened out after deseasonalising.
- On February 21, there was an anomalous sharp fall in spending for all retail categories.
- On February 22, there was an anomalous sharp rise in spending for all retail categories.

Fig. 2. Deseasonalised daily time series figure of spending by retail category, February 1 – March 31, 2022.

I also deseasonalise daily spending per transaction by day of week (Fig. 3). One can observe the following:

- There continues to be a weekly cyclical pattern of consumption observed in Fig. 1, albeit smoothened out after deseasonalising.
- On February 21, there was an anomalous sharp fall in spending per transaction for all retail categories.
- On February 22, there was an anomalous sharp rise in spending per transaction for all retail categories.

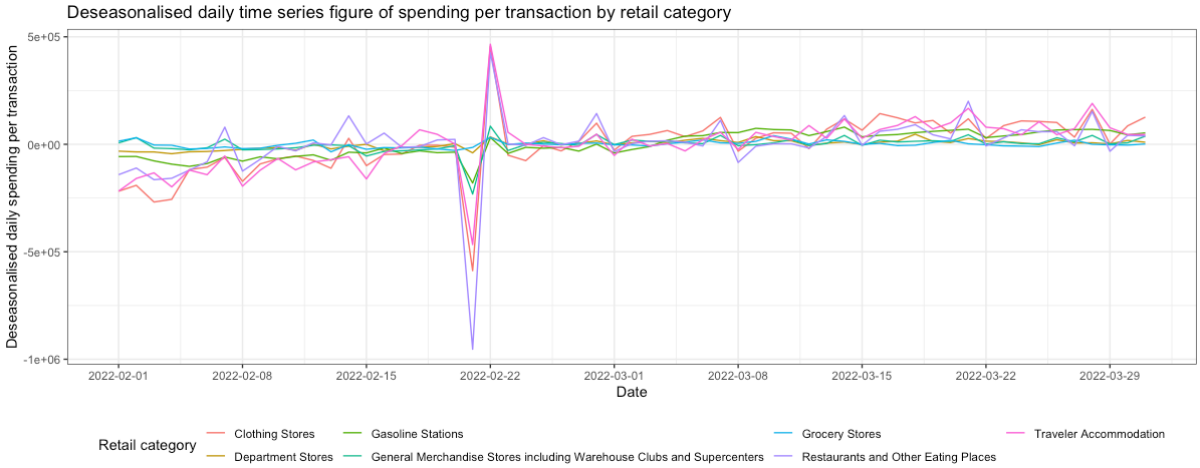

Fig. 3. Deseasonalised daily time series figure of spending per transaction by retail category, February 1 – March 31, 2022.

Figs. 2 and 3 suggest that the initial announcement of NATO sanctions on February 21 may have caused a drastic fall in same-day retail spending. It is possible that fears of further economic and military escalation against Russia and its allies led to a bleaker economic outlook in the US, temporarily depressing spending. The rebound in retail spending on February 22 may be due to confidence that the economic blowback from NATO sanctions would be limited. Thereafter, retail spending does not deviate from trend – not even on February 24, the day Russia invades Ukraine.

To assess the change in retail spending about the Russian invasion by geography and retail category, county-level data in California is analysed – in particular, the change in retail spending from 5 business days prior to 5 business days post February 24. Fig. 4 indicates the change in retail spending in California by county, by decile (1 – lowest decile; 10 – highest decile).

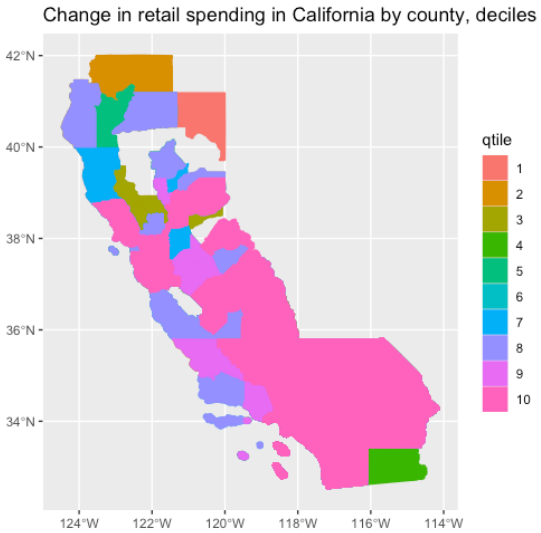

Fig. 4. Change in retail spending in California by county, deciles, February 17 – March 3, 2022.

Figs. 5a – 5g show the change in retail spending in California by county, by decile, across all seven retail categories. Spatial data is generated from random samples of 300 – 500 line items for each retail category.

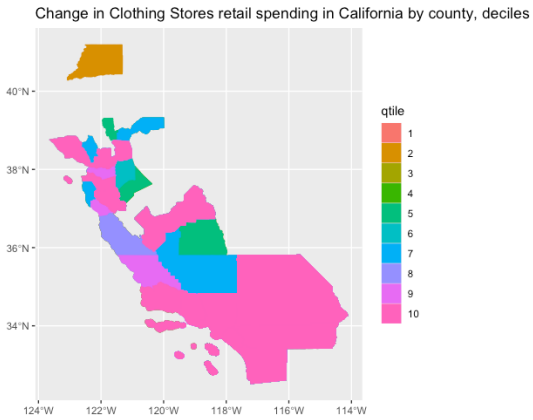

Fig 5a. Change in Clothing Store retail spending in California by county, deciles.

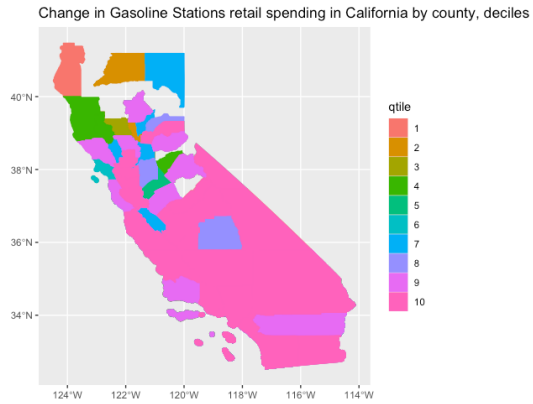

Fig 5b. Change in Gasoline Station retail spending in California by county, deciles.

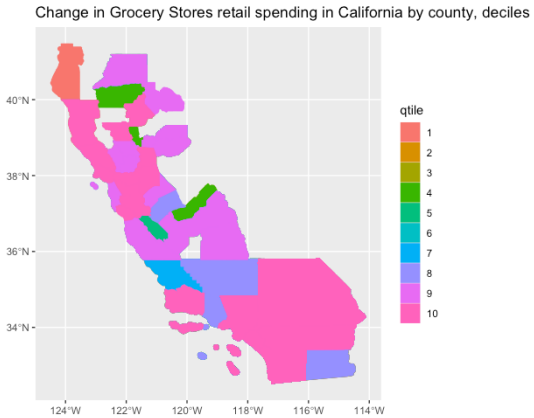

Fig 5c. Change in Grocery Store retail spending in California by county, deciles.

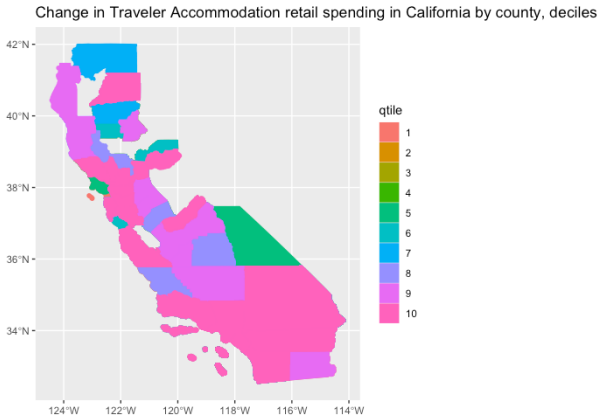

Fig 5d. Change in Traveller Accommodation retail spending in California by county, deciles.

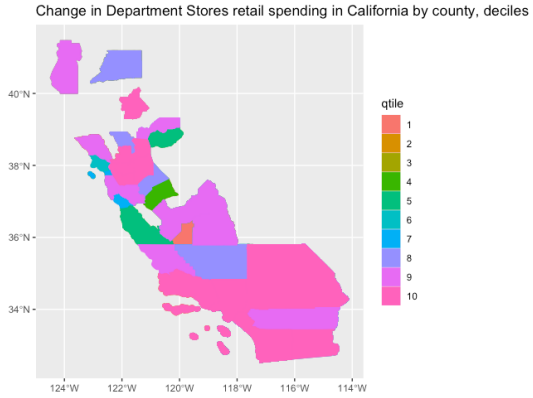

Fig 5e. Change in Department Store retail spending in California by county, deciles.

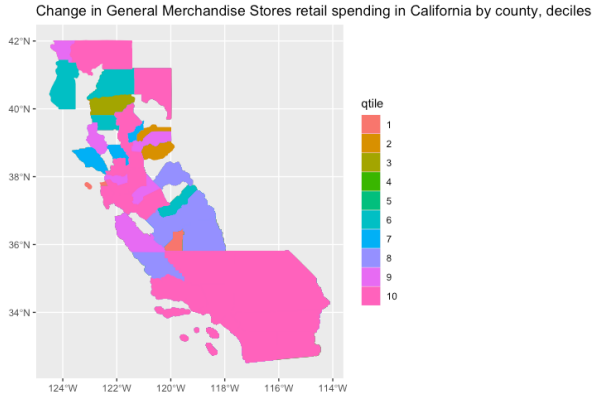

Fig 5f. Change in General Merchandise Store retail spending in California by county, deciles.

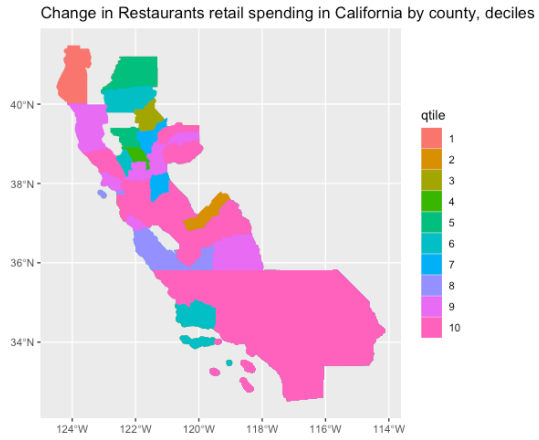

Fig 5g. Change in Restaurant retail spending in California by county, deciles.

One can observe the following trends:

- The largest increases in retail spending (denoted by blue, purple and pink) are located in California's south-eastern and central counties.
- Of all retail categories, gasoline stations saw largest number of counties in the top decile of retail spending.

This indicates that the spending profile of different counties, even within the same state, can differ widely. While most counties witnessed a relatively large change in spending at gasoline stations, far north-western counties like Del Norte and Humboldt fall in the bottom decile of spending at gasoline stations, grocery stores, and restaurants because of their rural profile. However, it is notable that spending on gasoline experiences a large change across most counties compared to other retail categories. This is possibly because spending on gasoline represents a large proportion of household income, rendering consumption highly sensitive to shifts in price.[15]

Finally, the correlation of the change in spending on gasoline by county with changes in spending on all other goods and services is examined. A linear bivariate regression of the standardised change in spending for all other goods (*delta_STD_gen)* against that of gasoline (*delta_STD_gas)* is conducted. The results (Fig. 6) are as follows:

Coefficients (no fixed effects):	Estimate	Std. Error	t Value
Intercept	0.35354	0.06392	5.531
delta_STD_gas	-0.00588	0.0271	-0.217

Fig. 6. Coefficients from linear bivariate regression of delta_STD_gen on delta_STD_gas.

Given a t value of $|-0.217| < 2$, we conclude at the 5% significance level that there is no correlation between the change in spending for gasoline and that of all other goods.

I then conduct a linear bivariate regression, with state fixed effects (*STATEFP)*, of the standardised change in spending for all other goods (*delta_STD_gen)* against that of gasoline (*delta_STD_gas)*. The results (Fig. 7) are as follows:

Coefficients (fixed effects):	Estimate	Std. Error	t Value
Intercept	0.126582	0.405634	0.312
delta_STD_gas	-0.005581	0.027433	-0.203

Fig. 7. Coefficients from linear bivariate regression of delta_STD_gen on delta_STD_gas, with state fixed effects.

[15] "Understanding Transportation Energy Burdens," American Council for an Energy-Efficient Economy, last modified May 20, 2021, https://www.aceee.org/white-paper/2021/05/understanding-transportation-energy-burdens.

Given a t value of $|-0.203| < 2$, we conclude at the 5% significance level that there is no correlation between the change in spending for gasoline and that of all other goods. Note that the t value under state fixed effects is slightly smaller than that under a simple bivariate regression. This means that when restricting the effect of *delta_STD_gas* on *delta_STD_gen* to within-state variation, any correlation measured is even less significant.

Conclusion

This memorandum concludes the following:

- Despite its military and geopolitical significance, the Russian invasion of Ukraine is not a long-term driver of retail spending. This could be due to the US' robust, domestic energy and agricultural production, and its historically weak commercial links to the Russo-Ukraine region. To boost household consumption, the current administration should focus on addressing other economic distresses, such as Covid-19 related supply-chain disruptions or demand-side pressures from a hitherto permissive Federal Reserve policy, which demand further study.
- The same exogenous shock to retail spending will affect US households differently, depending on geographic location. It may be prudent to introduce more surgical state and county-level policies to raise retail spending, in conjunction with broad-based federal programs like the Federal Pandemic Unemployment Compensation (FPUC) that already exist. Disbursing federal funds to state officials to implement policies most appropriate to their spending profile might be a more efficient method of raising retail spending in certain categories.
- Categories of retail spending like gasoline, which affect a large number of US households, should be a priority for policymakers.
- As a policymaker, it is difficult to extrapolate how changes in gasoline prices or spending will impact spending in other retail categories, as they are not significantly correlated.

It is this author's hope that this memorandum underlines the limited, observable economic impact of the Russian invasion of Ukraine on US retail spending. Moreover, any policy aiming to boost US household consumption should consider how spending profiles vary across counties and states.

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