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Using Beige Book Text Analysis to Measure Supply Chain Disruptions

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Since the onset of the pandemic, the global supply chain has been racked by disruptions. A shortage of semiconductor chips has crimped the production of automobiles and other consumer durable goods; a shortage of workers has caused difficulties both producing and transporting goods; and lockdowns in China are likely to compound these and other existing issues.

Economists at the Federal Reserve Bank of St. Louis and elsewhere have been studying the economic effects of global supply chain disruptions since the onset of the pandemic.[1] One of the most pernicious effects has been a rapid acceleration in CPI inflation, which reached a 40-year high in May. Higher inflation reflects both a surge in demand—fueled in part by aggressively expansionary monetary and fiscal policies—and a reduction in supply, which many economists have attributed to supply chain disturbances.

Simple, automated text analysis can extract useful metrics about supply chain disruptions from the Beige Book.

But it is one thing to *study the effects* of supply chain disruptions and altogether another to *measure* supply chain disruptions. This essay constructs a qualitative measure developed from the Federal Reserve's Beige Book report, a publication that summarizes recent economic developments and anecdotes within each Federal Reserve District twice each quarter. Our measure, called the Beige Book Supply Chain Disruption Index (BBSCDI), is quite simple: For each Beige Book, in this case back to 1990, it counts each time any of a list of supply chain-related words or phrases is used.[2] Given the nature of the Beige Book, it is likely that such references correlate with supply chain difficulties.[3] Gascon and Werner (2022) use a similar methodology to develop qualitative employment and inflation measures from Beige Book wording.

One commonly used measure of supply chain disruptions is the supplier delivery index (SDI), which is a component of the National Association of Purchasing Managers (NAPM) Purchasing Managers Index (PMI). The SDI is constructed such that increases represent slower delivery times for moving finished goods from factories to retailers. In May 2021, the SDI rose to its highest level since April 1974.

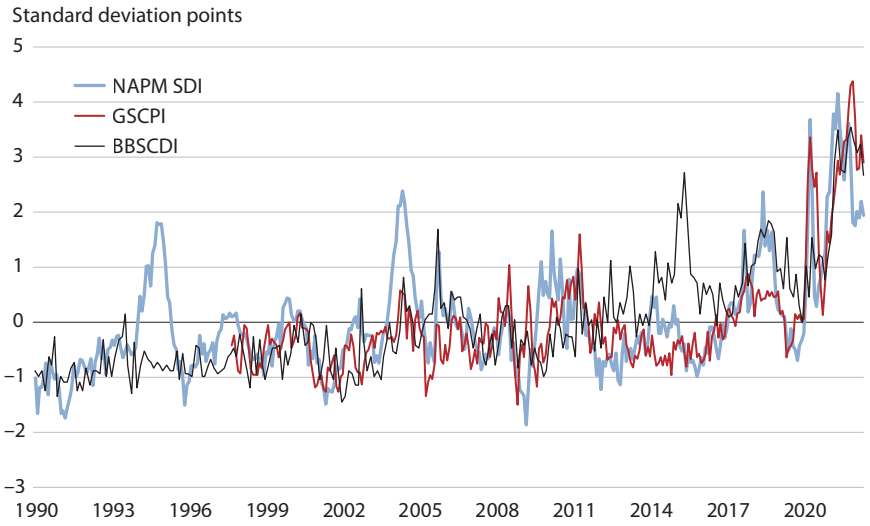
Last year, researchers at the Federal Reserve Bank of New York developed a new, more comprehensive measure of supply chain disruptions called the Global Supply Chain Pressure Index (GSCPI).[4] The GSCPI, which comprises 27 economic indicators across six countries and the euro area, is designed "to gauge the importance of supply constraints with respect to economic outcomes."[5] As with the SDI, increases in the GSCPI signal increased supply constraints.

The figure plots the BBSCDI and the two other supply chain measures described above. The BBSCDI and the SDI are put on the same scale as the GSCPI—that is, each observation shows how many standard deviations the underlying index is from its historical mean. Observations above (below) zero can be interpreted as above- (below-) average levels of supply chain disruptions. The SDI begins in 1997; the other two begin in January 1990.

A few conclusions can be drawn from the figure. First, the indexes can move sharply from month to month. Second, despite this volatility, the indexes generally move in the same direction over time. Indeed, the correlation between the BBSCDI and the SDI is 0.56, while the correlation between the BBSCDI and the GSCPI is 0.65.[6] These co-movements are particularly noteworthy given the GSCPI has an international scope, whereas the SDI and BBSCDI focus on U.S. supply chains—which speaks to the globalization of the U.S. economy. On the other hand, it is clear that the BBSCDI can and does capture information about supply chain disruptions the other two indexes do not; for instance, only the BBSCDI spiked in 2015, when the effects of a widespread labor strike along West Coast ports were widely discussed by Federal Reserve contacts.

All three indexes show that supply chain disruptions have occurred in the past but that they were generally one-off events. For example, all three indexes spiked around

Measures of Global Supply Chain Disruptions



SOURCE: Federal Reserve Banks of New York and St. Louis, National Association of Purchasing Managers, Haver Analytics, and authors' calculations.

October 2005, in the wake of hurricanes Katrina and Rita—but settled quickly thereafter. In comparison with these previous jumps, all three indexes have shown historically and consistently high levels of supply chain disruptions since the pandemic. Such persistent disturbances will no doubt continue to impact the economy in dramatic ways—most obviously by keeping inflation and cost pressures high. ■

Notes

[1] For instance, see Leibovici and Dunn (2022), Santacreu and LaBelle (2022), or Santacreu, Leibovici, and LaBelle (2021) and the references therein.

[2] Specifically, it counts every time any of the following phrases, words, or word roots are used: "supply chain-," "bottleneck-," "bottle neck-," "backlog-," "port-," "unfilled order-," "delivery time-," "supply delay-," "truck-," "boat-," or "transportation." While our index here simply sums these references, results are qualitatively similar if we instead construct the index as the sum of these references as a fraction of the Beige Book's size.

[3] Importantly, our method does not capture the sentiment or context of these references; a sentence describing supply chain easing would "count" as much as a sentence describing supply chain difficulties. However, a historical review of the Beige Book shows that supply chain disruptions are rarely mentioned except during times of stress, as shown clearly in our later comparison between our index and other indexes.

[4] See Benigno, Gianluca; di Giovanni, Julian; Groen, Jan J.J. and Noble, Adam I. "A New Barometer of Global Supply Chain Pressures." Federal Reserve Bank of New York *Liberty Street Economics*, January 4, 2022; https://libertystreeteconomics.newyorkfed.org/2022/01/a-new-barometer-of-global-supply-chain-pressures/.

[5] Federal Reserve Bank of New York. "New York Fed Launches Global Supply Chain Pressure Index." Press release, May 18, 2022; https://www.newyorkfed.org/newsevents/news/research/2022/20220518.

[6] The correlation coefficient measures the linear relationship between two variables and ranges from –1 to 1, where –1 indicates a perfect negative relationship, 0 indicates no linear relationship, and 1 indicates a perfect positive relationship.

References

Gascon, Charles and Werner, Devin. "Does the Beige Book Reflect U.S. Employment and Inflation Trends?" *Economic Synopses*, 2022, No. 13; https://doi.org/10.20955/es.2022.13.

Leibovici, Fernando and Dunn, Jason. "The Dynamics of International Shipping Costs." Federal Reserve Bank of St. Louis *On the Economy* (blog), January 3, 2022; https://www.stlouisfed.org/on-the-economy/2022/january/dynamics-international-shipping-costs.

Santacreu, Ana Maria and LaBelle, Jesse. "Global Supply Chain Disruptions and Inflation During the COVID-19 Pandemic." Federal Reserve Bank of St. Louis *Review*, Second Quarter 2022, *104*(2), pp. 78-91; https://research.stlouisfed.org/publications/review/2022/02/07/global-supply-chain-disruptions-and-inflation-during-the-covid-19-pandemic.

Santacreu, Ana Maria; Leibovici, Fernando and LaBelle, Jesse. "Global Value Chains and U.S. Economic Activity During COVID-19." Federal Reserve Bank of St. Louis *Review*, Third Quarter 2021, *103*(3), pp. 271-88; https://research.stlouisfed.org/publications/review/2021/05/05/global-value-chains-and-u-s-economic-activity-during-covid-19.

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