"Dude, Where's My Stuff?"

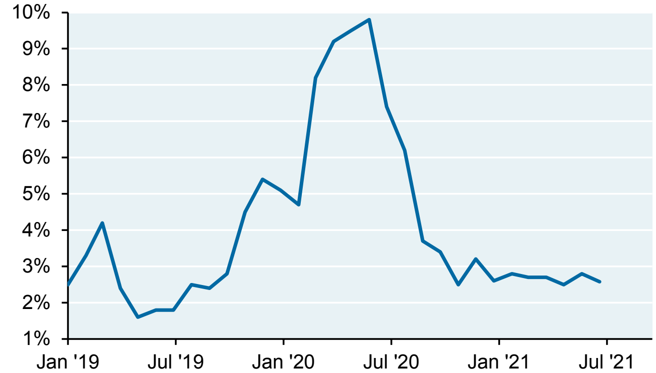
The global supply chain mess will require increased global vaccination and acquired immunity, semiconductor capacity expansion and the end of extraordinary housing/labor supports to resolve. We expect all three to occur over the next few months, leading to a global growth bounce in 2022

The containership industry is a good illustration of the supply chain mess: as shown in the first chart, more than 70 containerships are stacked up outside Los Angeles/Long Beach ports waiting to unload. Idle containerships are back to just 3% of the total fleet, shipping costs are surging, manufacturing delivery times are extended and rail shipments are declining sharply from their summer peak, illustrating the far reaching impact of the delays.

Anchored containerships in LA and Long Beach ports
Number of containerships

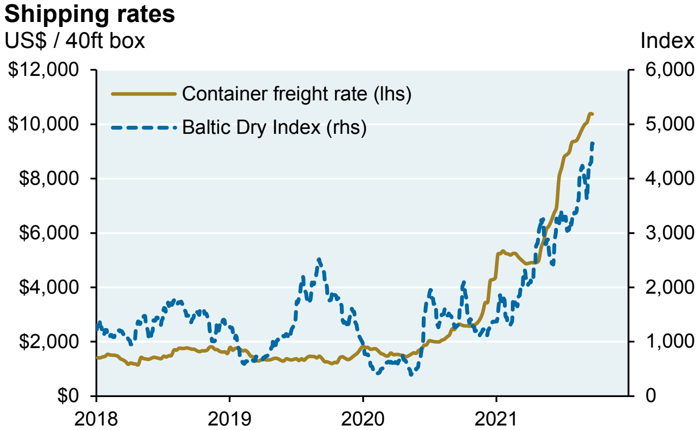
Source: Cornerstone Macro. September 20, 2021.

Idle containerships
% of global containership fleet



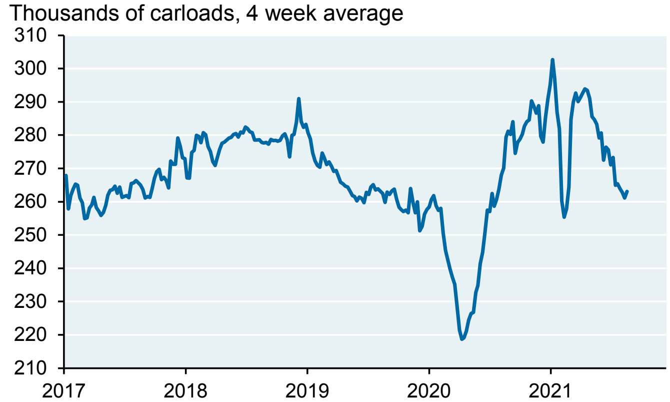
Source: USDA. July 2021.

Shipping rates
US$ / 40ft box



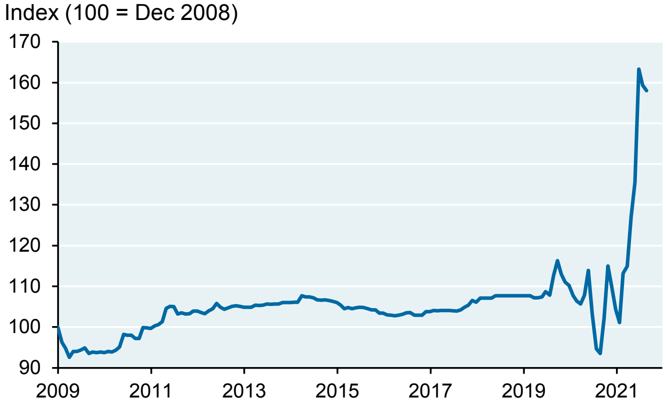
Source: Bloomberg. September 23, 2021.

US rail shipments
Thousands of carloads, 4 week average



Source: Association of American Railroads. September 18, 2021.

Arrangement of freight and cargo prices (PPI)
Index (100 = Dec 2008)



Source: Bloomberg. August 2021.

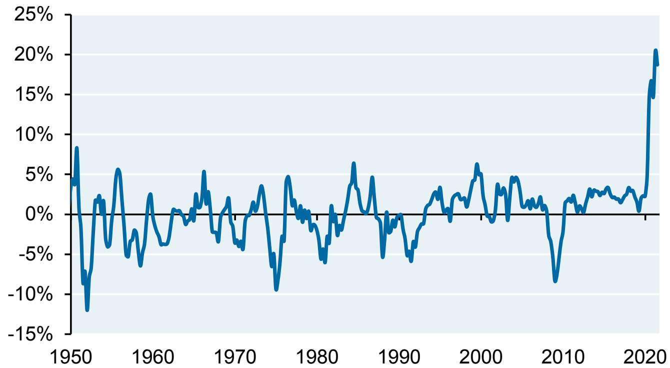
Global manufacturing delivery times
Index

Source: Bloomberg, JP Morgan Economic Research. August 2021.

Why so many bottlenecks? Supply chain disruptions due to shipping cost discrepancies

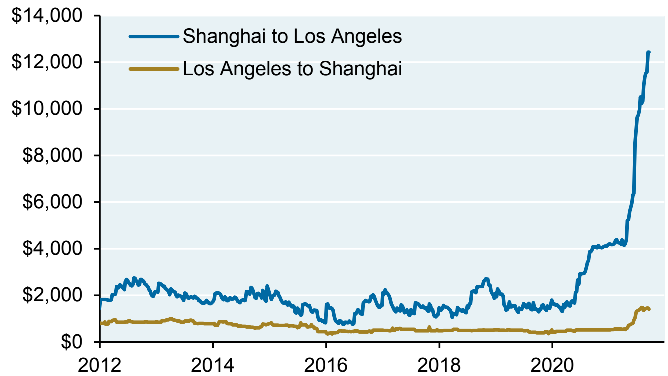
COVID has disrupted supply chains in two major ways: surging demand for imported consumer goods in the West due to pandemic work from home trends and home improvement spending, and a decline in workers required to maintain and operate these supply chains. The surge in US import demand has led to a sharp rise in eastbound freight rates (see charts for Shanghai->LA and Shanghai->Rotterdam). **However, westbound freight rates have not risen nearly as much, leading to an odd and problematic phenomenon: incentives for container owners to move them back to China *empty* to accelerate receipt of eastbound freight rates, instead of waiting for containers to be refilled to earn westbound freight rates as well**. This is illustrated in the fourth chart which shows departing containers from LA/LB: a lot of them started leaving empty once eastbound freight rates surged. This further exacerbates supply chain issues, since US goods (i.e., grains) that were supposed to depart US railcars and warehouses for export remain in place, occupying space that US imported goods were destined for.

A surge in US goods spending
Difference in rolling 5 quarter growth rates, goods - services



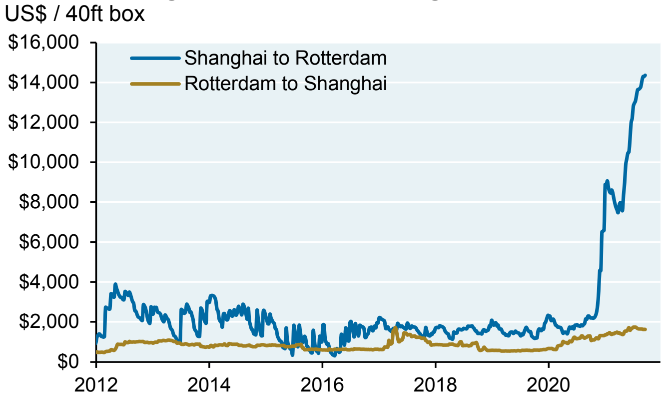
Source: BEA, JPMAM. Q2 2021.

Container freight rate between LA and Shanghai
US$ / 40ft box



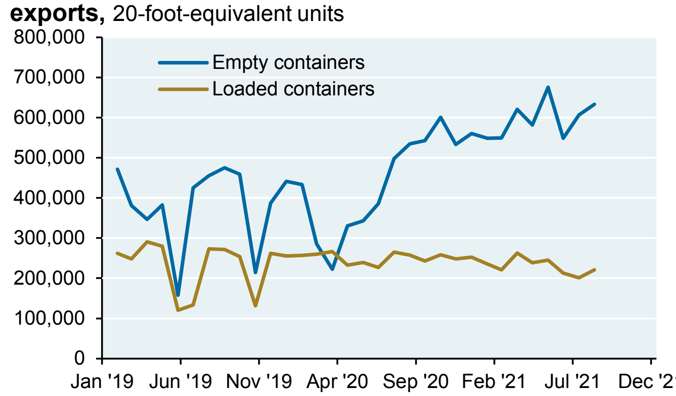
Source: Bloomberg. September 23, 2021.

Container freight rate between Shanghai and Rotterdam
US$ / 40ft box



Source: Bloomberg. September 23, 2021.

Los Angeles / Long Beach empty vs loaded container exports, 20-foot-equivalent units



Source: Port of Los Angeles and Long Beach. August 2021.

The other big bottleneck: the semiconductor shortage

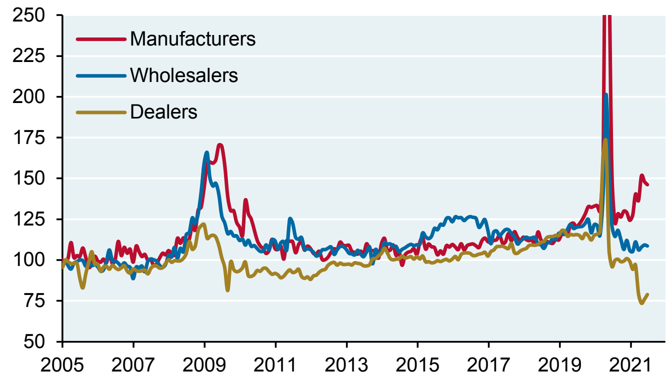
Semiconductors are the world's 4th most traded good after crude oil, refined oil and cars. Strong demand existed before COVID and reflected the chip-intensity of 5G, AI, electric vehicles (3-5x the chip content of ICE cars) and the internet of things. Current chip shortages are mostly related to older and simpler 200-mm silicon wafers used in cars, computers, monitors, laptops, TVs, refrigerators and washing machines. **Demand for many of these items soared during the pandemic as people built out home offices and related projects**; this surge in demand is illustrated below via the rise in Taiwanese electronic component exports. One by-product of the shortage: **a rise in US auto manufacturer inventories and a collapse in dealer inventories as manufacturers wait for the chips they need**. Auto consulting firm Alix now estimates that the semiconductor shortage will cost US auto manufacturers $210 bn this year, up from their $60 bn estimate back in January. Ford is actually offering customers faster delivery if they agree to "lower feature content", which translates into fewer semiconductors.

There's limited economic incentive to build new 200-mm chip plants given wafer-thin margins; only a handful of new ones are planned for 2022. Even so, there's a few billion dollars being invested to expand capacity by ~20% in existing plants, in which case the semiconductor squeeze may start to ease by Q2 2022. Auto manufacturers are also discussing longer term contracts with Tier 2 suppliers that might incent them to build out new 200-mm capacity. As shown below, adding capacity to existing factories will take a few months at least, in which case the semiconductor shortage will drag on into next year.

Taiwan exports of electronic components
Index (100 = Q4 2019)

Source: Ministry of Finance, JPMAM. August 2021.

US auto manufacturer vs dealer inventories
Real inventory/sales ratio, index (100 = Jan 2005)

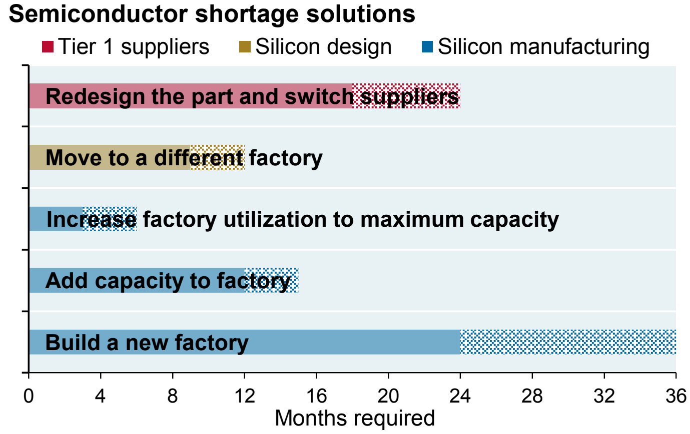


Source: Gavekal, BEA, JPMAM. June 2021.

Semiconductor fab capacity utilization rate
%

Source: Suttle Economics, SIA. 2021.

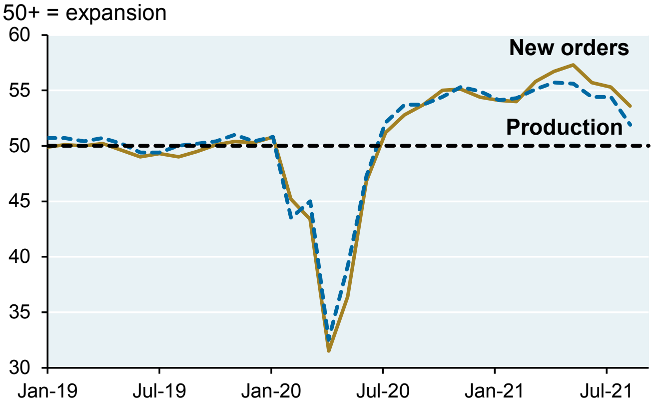
Semiconductor shortage solutions



Source: Bain. June 2021. Dotted bars indicate high end estimates.

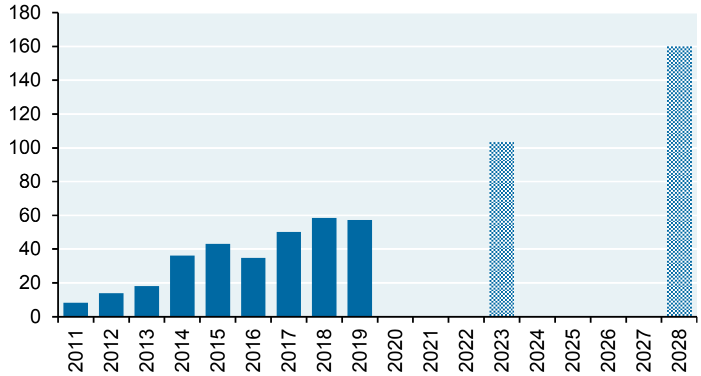
Note that global supply chain problems are not getting better as growth momentum slows, since production growth is declining as fast as new order growth. For all the clients that have asked me about the political and economic problems associated with the rise of autonomous vehicles and more unemployed truckers, **I keep telling them they've got it backwards: the US has had a trucker *shortage* for the last few years, and it's projected to get worse**. In other words, COVID has worsened some existing vulnerabilities in the US supply chain, just as global trade is surging. As for the August US inflation report in which CPI came in lower than expectations, that was mostly a function of COVID related declines in airfare, lodging and rental cars. These categories will probably bounce back when the Delta wave fades, and the other categories are still rising sharply.

Global manufacturing survey (PMI)
50+ = expansion



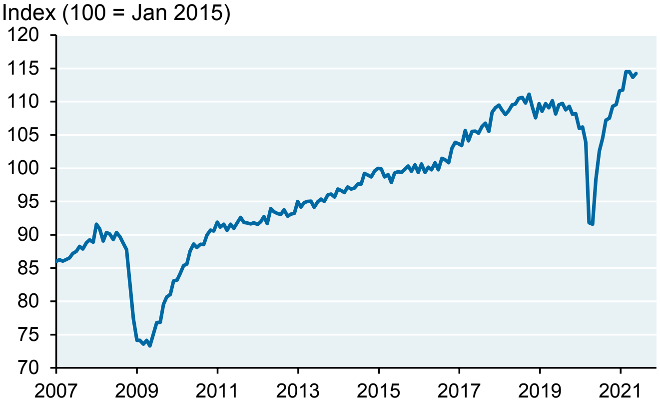
Source: Bloomberg. August 2021.

US truck driver shortage
Thousands of drivers



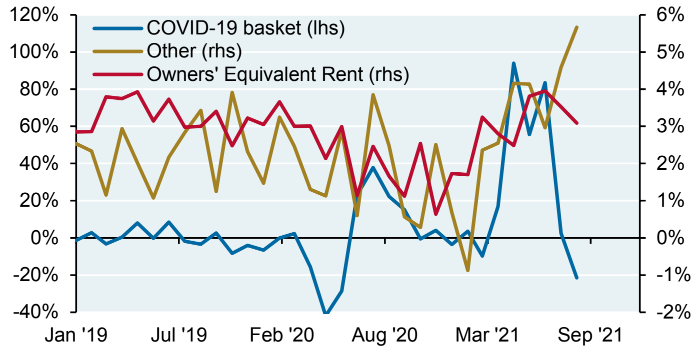
Source: American Trucking Associations. 2019. Dotted bars = forecasts.

Global trade volume
Index (100 = Jan 2015)



Source: CPB. June 2021.

Core CPI components
annualized m/m % change
annualized m/m % change

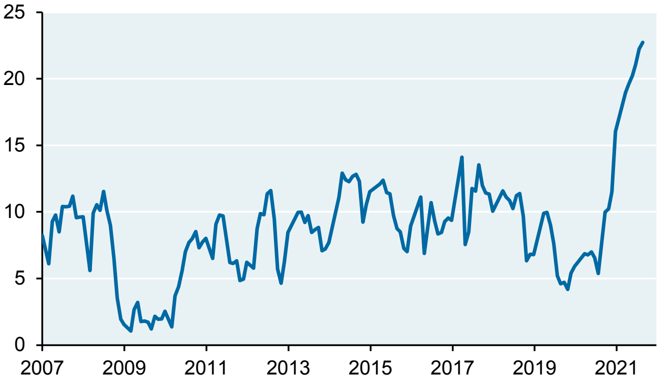


Source: Suttle Economics, BLS, JPMAM. August 2021. COVID-19 basket includes: apparel, lodging, airline fares, used cars, car insurance/rental.

Bottleneck resolution

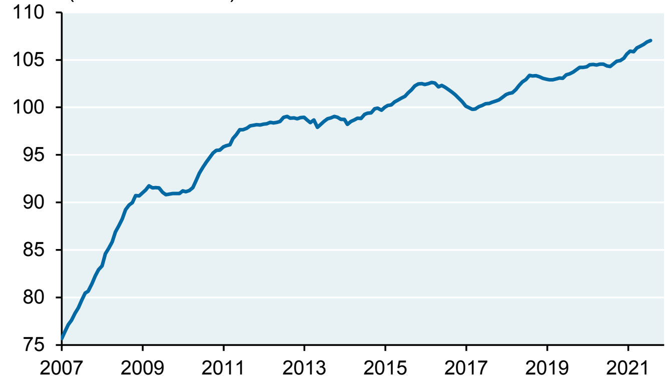
First, the world is going to need more containers, which carry more than 90% of the world's traded goods. Chinese companies affiliated with its government make 95% of the world's containers and have ramped up production. The number of containerships in service is rising as well, albeit more slowly; again, China stands to benefit as the world's largest shipbuilder (37% of the shipbuilding market in 2019 by deadweight, and 45% of all new shipbuilding orders). Another example of how China continues to reap unforeseen economic gains from COVID; another is the rise in global export market share that China has gained vs its Asian export competitors.

China container production
Million cubic meters



Source: Bloomberg. August 2021.

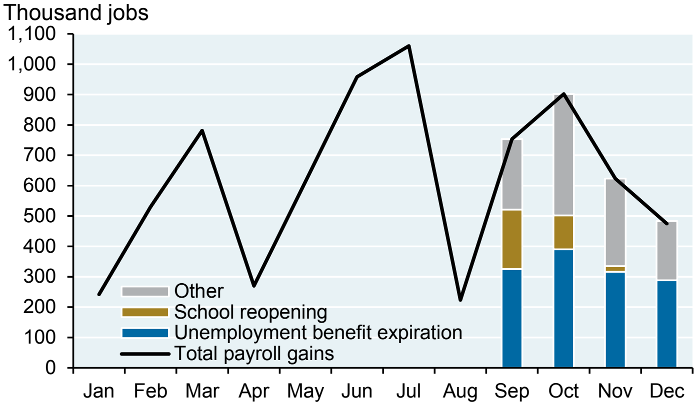
Global containerships in service
Index (100 = Jan 2015)



Source: Bloomberg. August 2021.

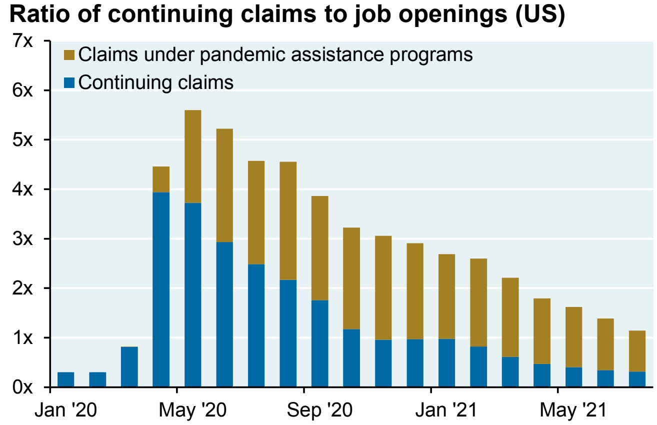
But more containers and containerships won't solve problems in the West unless other supply chain issues are resolved as well. That will probably require (a) an end to extraordinary housing and income support measures, and (b) less community spread and concern about COVID. So far, most analyses show **very little job growth differentials between US states that terminated subsidies vs those that didn't[1].** That said, some forecasts call for 1.3 million new jobs by year-end due to expiring unemployment benefits and another 300,000 new jobs due to school reopening. Around 2/3 of continuing claimants receive some pandemic unemployment assistance, which is another sign that such benefits are impacting the labor force participation rate.

2021 payroll gains with Sep-Dec forecasts
Thousand jobs



Source: GS. September 13, 2021. Bars represent forecasts.

Ratio of continuing claims to job openings (US)



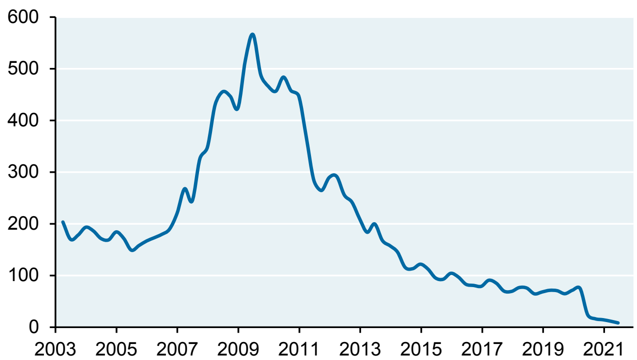
Source: Department of Labor, BLS, JPMAM. July 2021.

[1] *"Estimating the Impact of Unemployment Insurance Benefit Expiration on Employment Using August Microdata"*, Joseph Briggs, Goldman Sachs, September 16, 2021.

The federal **foreclosure moratorium** officially ended on July 31. However, we don't anticipate a sharp rise in new foreclosure filings due to a CFPB rule issued in June that established procedural safeguards that have to be met before foreclosures can begin (hurdles are hard to meet and include provisions that a property has to be abandoned, or that the servicer hasn't heard from the borrower for an extended period). The new rule expires in December 2021, after which normal foreclosure patterns might resume. Foreclosures fell close to zero in the US once the moratorium was put in place. The second chart shows the gap between the MBA definition of delinquency which defines deferred payments as delinquent, and the Fed definition which does not. See Appendix on page 9 for a discussion of homeowner vs renter treatment.

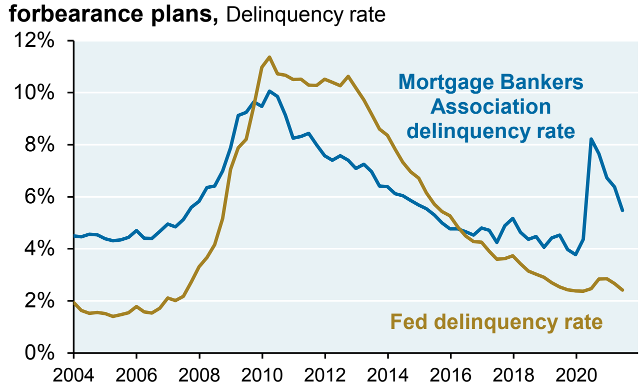
One more thing on housing: **read about the issues with LoanDepot**. So, one of many undercapitalized fintech lenders (most of whom have limited special servicing capabilities) allegedly processed thousands of loans without required documents such as employment and income verifications? Color me unsurprised[2].

US home foreclosures
Thousands



Source: Bloomberg, Federal Reserve. June 2021.

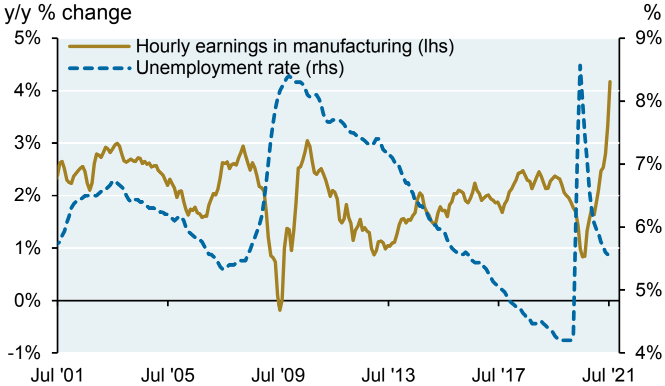
Mortgage delinquency rates depend on treatment of forbearance plans, Delinquency rate



Source: Bloomberg. Q2 2021.

Housing and income policy may have to normalize before labor supplies do. As shown below, G7 manufacturing wages are rising at a *very* high rate given the prevailing level of unemployment, another sign of labor markets whose supply-demand equilibrium has shifted. By the way, I find it interesting that **some people arguing for continued extension of COVID benefits also argue for the largest amount of new Congressional spending ($3.5 trillion)**, without explaining what that might do to current labor shortages, where all these new workers are supposed to come from and how all that spending might impact inflation and Fed policy. In August, 50% of small business owners said they had job openings they already couldn't fill, the highest level on record.

G7 unemployment and earnings
y/y % change



Source: OECD. July 2021. 3 month average.

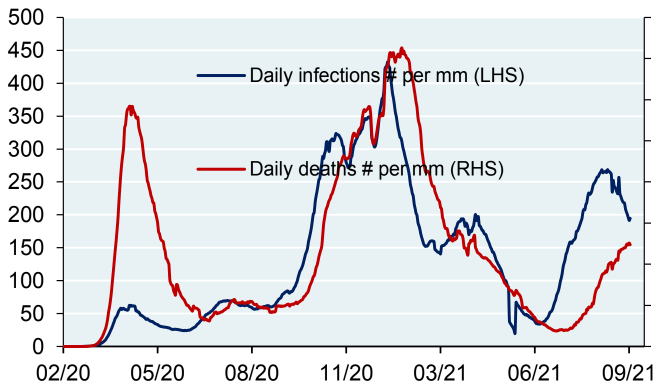
US small businesses with hard to fill job openings
% of small business survey respondents

Source: Bloomberg, NFIB. August 2021.

[2] According to a paper released by the Philadelphia Federal Reserve, **70% of the massive rise in fintech loans is simply due to regulatory arbitrage** rather than fintech lenders having superior technology or lower costs. Also: shadow banks now control the riskiest segment of the market (FHA). You get what you pay for. See "*Fintech, Regulatory Arbitrage and the Rise of Shadow Banks*", Buchak et al, NBER, 2017.

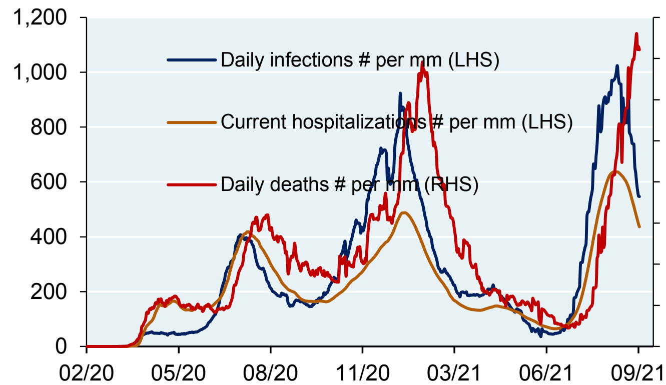
As for COVID, concerns may dissipate in the next few months. As we explained on our August webcast, this fall was going to be a very bad one in the US. Even so, given the high degree of Delta variant contagiousness, a combination of vaccination and acquired immunity should drive down pandemic measures substantially by November. The latest infection and hospitalization data from Hotspot states, horrific as they are (i.e., the world's highest reported mortality rate) are beginning to roll over; mortality should follow. For anyone that disbelieves COVID mortality data, see the sixth chart below: there has been another surge in mortality from all causes in the US relative to seasonal trends. If you can think of another reason for this other than COVID, please let me know. The biggest risk to this outlook is fading immunity of vaccinated people; we will know over the next couple of months how this plays out in the US. Booster shots in Israel appear to drive antibody levels up substantially, and also result in Pfizer efficacy vs severe infection that rises above 90% again.

Developed regions



Source: JHU, IMF, JPMAM. Sep 25, 2021. 7 day smoothing.

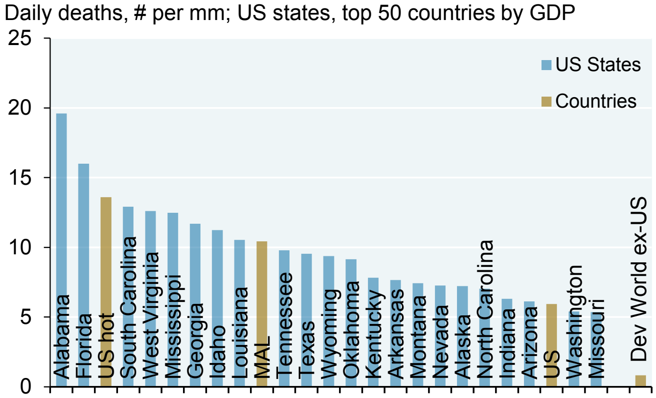
Hotspots: AL AK FL GA KY SC TN WV WY



Source: JHU, IMF, HHS, JPMAM. Sep 25, 2021. 7 day smoothing.

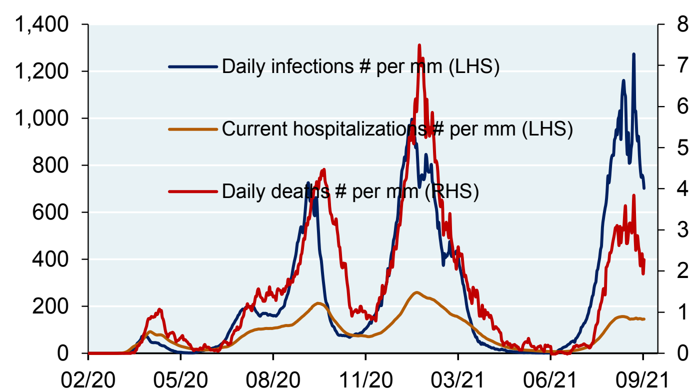
25 highest mortality rates vs Dev World ex-US

Daily deaths, # per mm; US states, top 50 countries by GDP



Source: Johns Hopkins University, IMF, JPMAM. September 26, 2021.

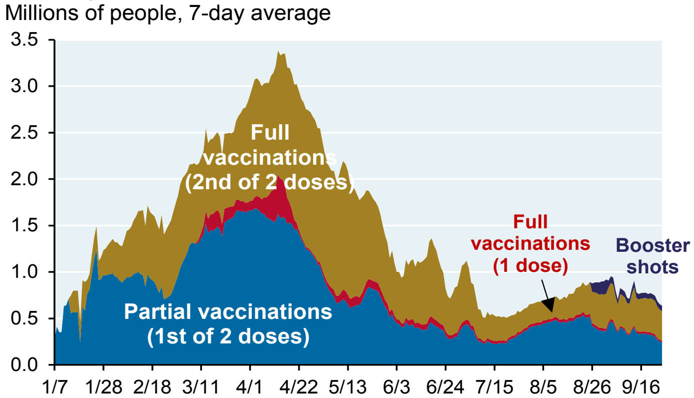
Israel



Source: JHU, IMF, OWID, JPMAM. Sep 25, 2021. 7 day smoothing.

US daily vaccinations

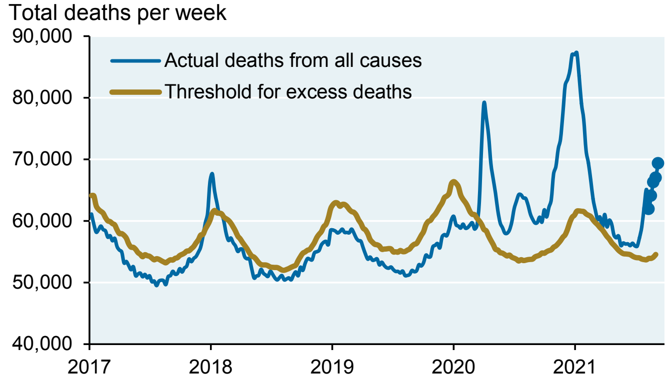
Millions of people, 7-day average



Source: OWID, JPMAM. September 25, 2021.

Tracking US excess deaths from COVID

Total deaths per week

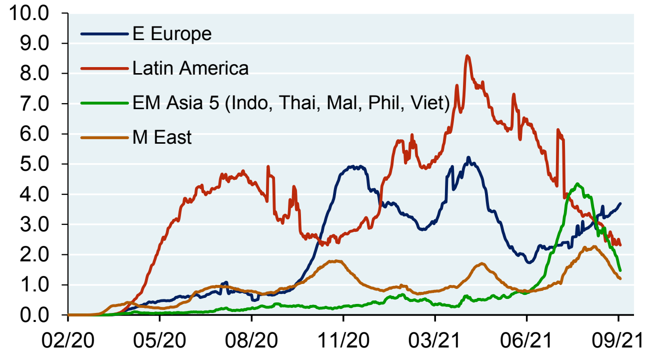


Source: CDC, JHU, JPMAM. September 18, 2021. Dots are estimated using most recent JHU data.

Developing world infections and mortality are declining due to exhaustion of Lambda and Gamma variants in Latin America and the decline in the Delta variant in Asia (although mortality is rising in Eastern Europe again). Many Asian countries have higher COVID stringency rules than developed countries, an indication of how seriously govt's view the risks and the ability of their healthcare systems to respond to it. Emerging markets are not the epicenter of most supply chain problems, at least as measured by supplier delivery times. **But countries like Malaysia play an outsized role in the semiconductor food chain due to its role as a major center for chip testing and packaging**, the last step in the semiconductor food chain which is also more labor-intensive than automated wafer fabrication. The delta variant has caused Infineon, NXP and STMicroelectronics shutdowns in Asia, which resulted in component shortages at Nissan, Toyota, Ford and GM operations elsewhere. Malaysia is also a large producer of multilayer ceramic capacitors, used in smartphones and cars.

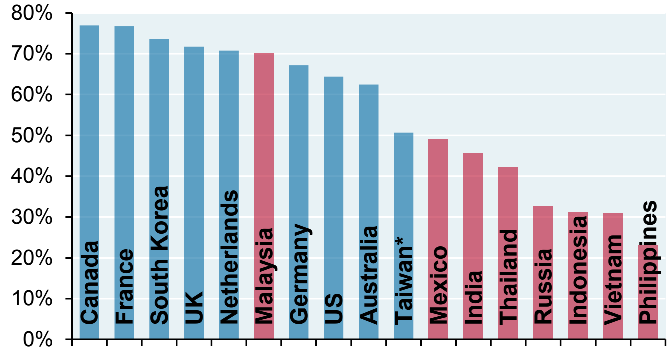
Some good news on Asia. As noted above, infections and mortality are finally rolling over. Vaccination rates have hit 70% in Malaysia; while they are still less than 50% in Indonesia, Thailand, Philippines and Vietnam, acquired immunity appears to be playing a role now as well. Furthermore, mRNA vaccines should make greater inroads in the entire region in 2022, displacing Chinese vaccines with lower observed efficacy[3]. Finally, capital flows are returning in anticipation of less severe bottleneck issues ahead.

Emerging markets COVID trends
Daily deaths, # per mm, smoothing = 7 days



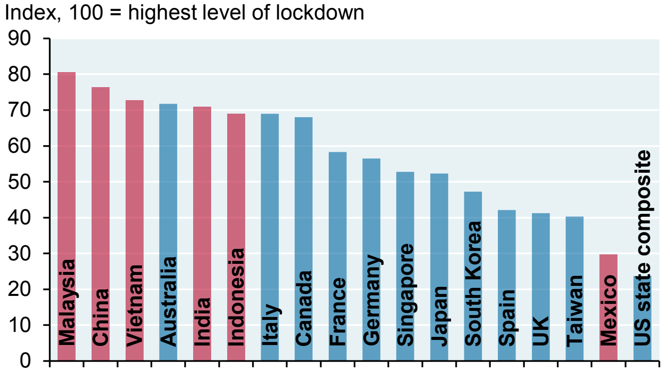
Source: Johns Hopkins University, IMF, JPMAM. Sep 26, 2021.

Country vaccination rates
Unique people vaccinated as % of population



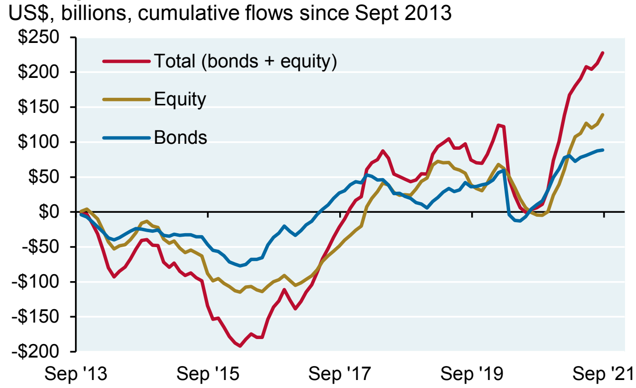
Source: OWID, JPMAM. September 25, 2021.

Oxford lockdown stringency index
Index, 100 = highest level of lockdown



Source: University of Oxford, JPMAM. September 26, 2021.

EM capital inflows
US$, billions, cumulative flows since Sept 2013



Source: EPFR, JPMAM. August 2021.

[3] "*Ravaged by Delta outbreak, Southeast Asia shifts away from China's vaccines*", Washington Post, August 10

Appendix: Homeowners vs Renters and US housing policy

- As discussed on page 6, the federal ***foreclosure*** moratorium has expired and there are safeguards in place which should keep the number of foreclosures low until early next year when a CFPB rule expires. The federal ***eviction*** moratoria are separate policies; some have already expired, while GSE and FHA versions will expire at the end of September. Eviction rules cover renters and homeowners, while foreclosure rules only apply to homeowners. Several Democratic Senators have introduced legislation to reinstate federal eviction moratoria after the Supreme Court ruled that the CDC overstepped its authority in mandating it
- States can apply their own foreclosure and eviction moratoria alongside the federal government; banks are required to follow both. There are currently live foreclosure moratoria in NY, Oregon and DC
- **While federal eviction moratoria prohibited evictions of renters and homeowners, the treatment for missed payments is different**. For example, delinquent renters at the end of the moratorium are treated differently than homeowners who missed payments while in a CARES Act forbearance. Homeowners with federally backed mortgages (or with mortgages from banks applying this approach to all borrowers at their discretion) are allowed to defer missed payments and are not considered to be delinquent. In these cases, homeowners that don't pay will not face immediate payment of accrued balances, which in most cases will be added as a balloon at the end of their mortgages. Banks generally record unpaid interest as current on an accrual basis. Finally, there are programs in place to modify mortgages for borrowers unable to resume their prior payments due to financial distress.
- Renters, however, are not explicitly allowed to defer; the eviction moratorium simply prohibits landlords from evicting them for non-payment. **Renters could face immediate payment of accrued amounts, with any negotiated terms up to the landlord**. In addition, non-payment could affect a renter's credit score, while the same is usually not the case with homeowners under the circumstances outlined above.
- The Federal Emergency Rental Assistance program made $47 billion in funding available for tenants and landlords to be distributed by states and local governments. This funding was aimed at helping tenants cover rent, back rent and utilities as well as helping landlords cover mortgage payments**. However, only $5 billion of this program was distributed as of July 2021**.
- The National Equity Atlas estimated that as of mid-August 2021, 15% of renters (5.9 million renter households) were behind on rent payments. This compares to ~7% of renters unable to pay rent in 2017.
- Landlords who hold federally backed mortgages were eligible for the federal mortgage and foreclosure relief programs, which were extended through June 30, 2021.
- In addition, some states established their own rental relief programs. For example, New York's landlord loan program provides loans to small landlords with a loss of rental income, and California's rental assistance program helps both tenants and landlords cover rent and mortgage payments at the expiration of the eviction and foreclosure moratorium

Estimates of delinquent renters and outstanding payments

	Dec '20	Jan '21	Feb '21	Mar '21	Apr '21	May '21	Jun '21
Delinquent rent, utilities & late fees ($, billions)	$44.1	$52.6	$36.3	$31.9	$34.9	$38.5	$41.2
Number of delinquent renters (millions)	8.8	9.4	7.3	6.0	6.3	6.6	6.7
Amount delinquent per renter ($)	$5,015	$5,586	$4,964	$5,282	$5,499	$5,854	$6,148
Average months delinquent	3.4	3.8	3.4	3.6	3.8	4.0	4.2

Source: Census Pulse Survey, BLS CES, Census HVS, Equifax, Moody's Analytics. Based on Moody's Analytics' February 2021 baseline economic outlook; assumes no additional fiscal relief; includes all delinquent renters, not just renters impacted directly by the pandemic.

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