Global Economics Analyst

Global Reopening: Slower, but Not Slow (Struyven/Bhushan)

- The three pillars underlying our view that vaccinations will further drive a strong global recovery remain intact. First, we expect the world to produce 13bn vaccine doses this year, all providing solid protection against severe disease. Second, rising immunity leads to substantial easing in our GS Effective Lockdown Index (ELI)—a combination of official restrictions and actual mobility data. Third, ELI easing continues to predict GDP growth well.
- However, we expect the remaining part of the service sector recovery to be less rapid than the early stages. Delta outbreaks are weighing on growth, and we see a fairly high probability that either winter seasonality, some reduction in natural or vaccine-induced immunity, or a somewhat more transmissible/evasive future strain lead to another temporary episode of moderate ELI tightening. Moreover, the concentration of the remaining weakness in services spending among individuals, sectors, and countries with a higher exposure or aversion to virus risk suggests that the remainder of the recovery will be more gradual.
- We next estimate reopening growth impulses under baseline and downside ELI scenarios. In the base case, the ELI eases further, except for a year-end tightening episode. Our baseline reopening impulse to global growth slows from 5pp annualized in Q2-Q3 to 3pp in Q4, and 1pp in 2022H1. We estimate the largest impulses in Q3 in India, Canada, and the Euro Area, but smaller gains in the US and China. In a downside scenario, substantial ELI tightening around year-end, for instance due to some vaccine escape or waning immunity, reduces the global reopening impulse to -2pp in Q1.
- Since the emergence of the Delta strain in early April, the gap between our 2021 global growth forecast and the median consensus forecast has narrowed from 1pp to 0.3pp, reflecting consensus upgrades and GS downgrades. We have made larger 2021 growth downgrades in low-vaccination Asian economies, including India and South East Asia, but also the US. Our growth forecasts now differ from consensus expectations by above-consensus 2021 views in economies with lots of room for reopening, such as India and Spain, and the sharpness of the US deceleration over the next year and a half on the back of a declining reopening impulse and a negative fiscal impulse.

Jan Hatzius
+1(212)902-0394 | jan.hatzius@gs.com
Goldman Sachs & Co. LLC

Daan Struyven
+1(212)357-4172 |
daan.struyven@gs.com
Goldman Sachs & Co. LLC

Sid Bhushan
+44(20)7552-3779 |
sid.bhushan@gs.com
Goldman Sachs International

Daniel Milo
+1(212)357-4322 | dan.milo@gs.com
Goldman Sachs & Co. LLC

Global Reopening: Slower, but Not Slow (Struyven/Bhushan)[1]

Markets have become concerned about reopening and growth as global infections have risen over the past month. In this *Analyst*, we first revisit our longstanding view that vaccinations will further drive a strong global recovery. We then discuss why we expect the remaining part of the global service sector recovery to be less rapid than the early stages, and conclude by estimating reopening growth impulses.

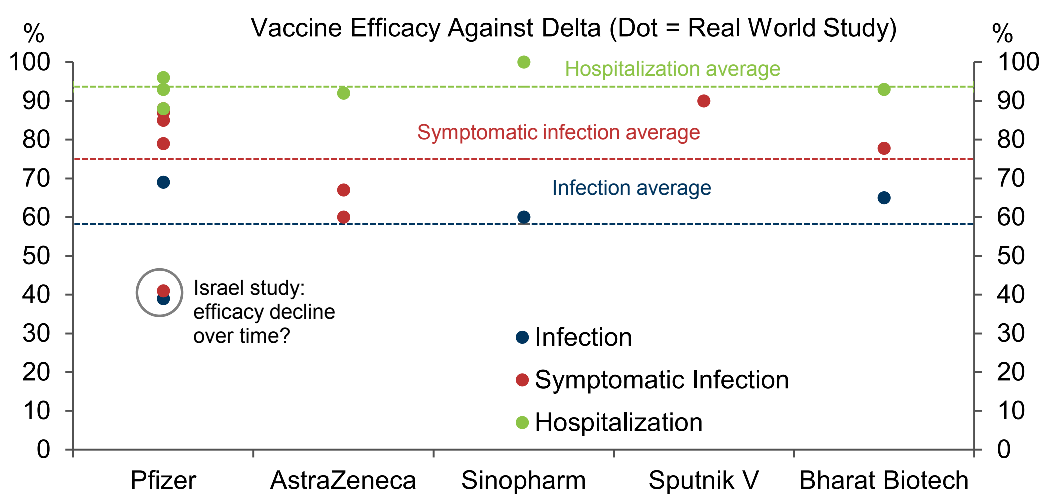
Still Constructive on Vaccine-Driven Recovery

Our constructive view of a vaccine-driven recovery has relied on (1) the mass production of vaccines that strongly protect against hospitalizations, (2) the resulting easing in restrictions, and (3) the growth boost from easing. These three pillars remain mostly intact, although news on the Delta strain and vaccine efficacy is mixed.

Pillar 1: Mass Production of Vaccines Strongly Protecting Against Severe Disease

The world remains on track to produce 13bn of vaccine doses this year, all providing strong protection against severe disease. Exhibit 1 shows that the efficacy of vaccines to prevent hospitalizations from the Delta strain remains elevated at around 90%. The Delta variant, however, is weighing on vaccines' ability to prevent (asymptomatic) infections. Pfizer and BioNTech also noted that "vaccine efficacy in preventing both infection and symptomatic disease has declined six months post-vaccination, although efficacy in preventing serious illnesses remains high".[2]

Exhibit 1: Vaccines Still Protect Against Hospitalization Risk



*Pfizer Israel and Singapore studies included Moderna in estimate. All Bharat Biotech and England Pfizer/AstraZeneca symptomatic infection estimates include a sample that was majority but not entirely Delta. Sputnik V estimate from press release only.

Source: Goldman Sachs Global Investment Research

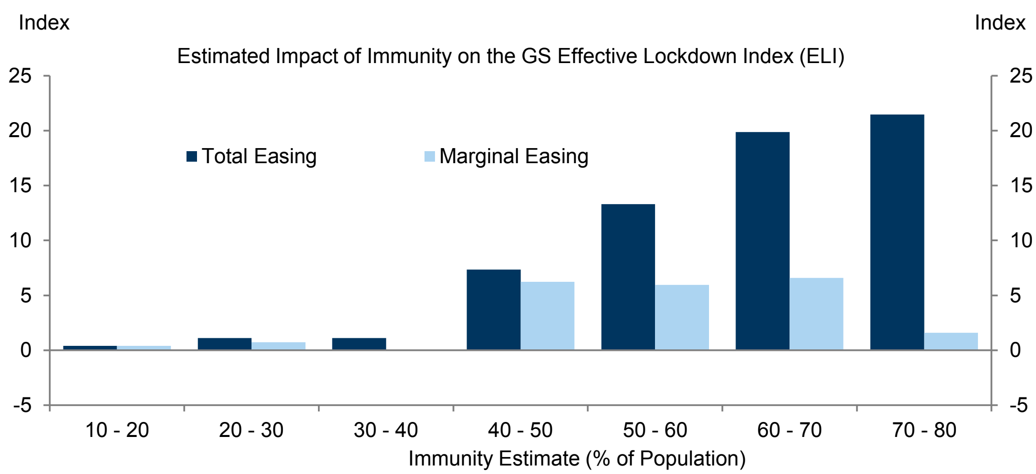
[1] We thank Dan Milo and Rina Jio for their contributions to this report.

[2] These Israeli and trial data make booster shots this year likely, slowing down distribution in low income economies.

Pillar 2: Higher Vaccination and Immunity Rates Lead to ELI Easing

Given solid vaccine protection against hospitalizations, ongoing rises in vaccination and immunity rates should drive easing of restrictions and growing consumer comfort. Our GS Effective Lockdown Index (ELI)—a combination of official restrictions and actual mobility data—has eased by 20 points this year in the group of high vaccination economies, while it has eased only slightly for low vaccination economies.[3] Using regressions, we find that higher estimates of our total immunity proxy (from vaccinations or infections) lead to easier ELI levels, and that the marginal effect is the highest in the 40-70% immunity range (Exhibit 2). Therefore, the further rise in global immunity we expect should drive further ELI easing.

Exhibit 2: Higher Immunity Leads to ELI Easing



Note: we regress the ELI on indicator variables representing each immunity level including country fixed effects and a time trend. The reference immunity level is 0-10% of population. Our results were robust to running regressions on changes, including lags and including time fixed effects.

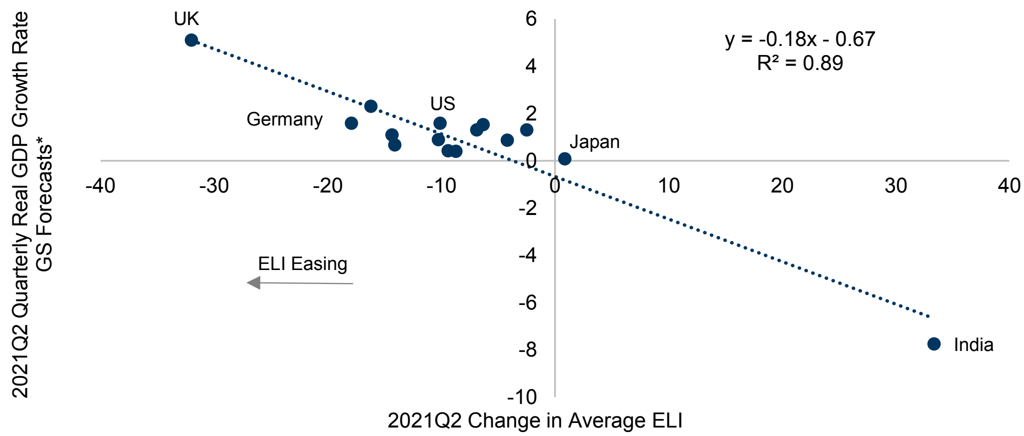
Source: Goldman Sachs Global Investment Research

Pillar 3: ELI Moves Predict Growth Well

Further ELI easing should support GDP growth because ELI moves continue to predict GDP growth well. Exhibit 3 shows the tight relationship for the largest economies in 2021Q2 between ELI changes and our quarterly GDP growth estimates. The coefficient of -0.18 implies a boost to non-annualized GDP growth of 1.8pp per 10-point decline in the ELI. Exhibit 4 shows that the sensitivity of activity to the ELI has diminished over time, consistent with our work on adaptation, and that growth appears more sensitive to ELI easing than to tightening.

[3] We focus on the large economies distinguishing between economies with a current first shot vaccination population rate above 40% (US, Euro Area, China, UK, Canada, and Brazil) and below 40% (India, Japan, Russia, Australia, South Africa, Indonesia, South Korea).

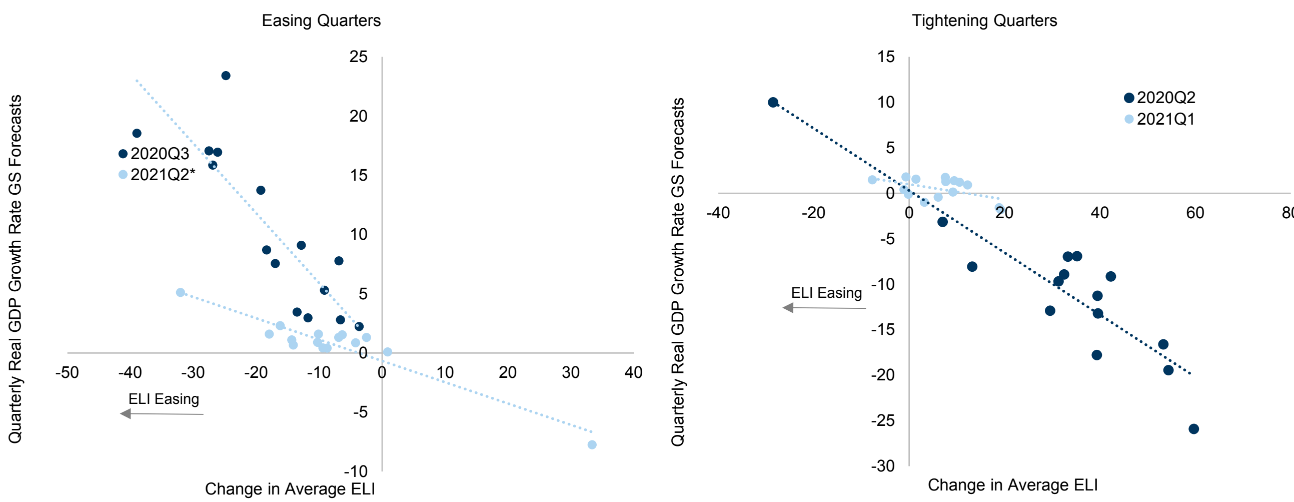
Exhibit 3: A Close Relationship Between Changes in the ELI and our Q2 Growth Estimates



Note: we exclude Russia due to oil price fluctuations.
*Or realized if available.

Source: Goldman Sachs Global Investment Research

Exhibit 4: The Sensitivity of Growth to the ELI Has Diminished over Time



*Or realized if available.

We exclude Russia due to oil price fluctuations and 2020Q4.

Source: Goldman Sachs Global Investment Research

A Less Rapid Next Leg of the Recovery

Although we remain constructive on the vaccine-driven global service sector recovery, we expect the next leg to be less rapid than the early stages, for both medical and economic reasons.

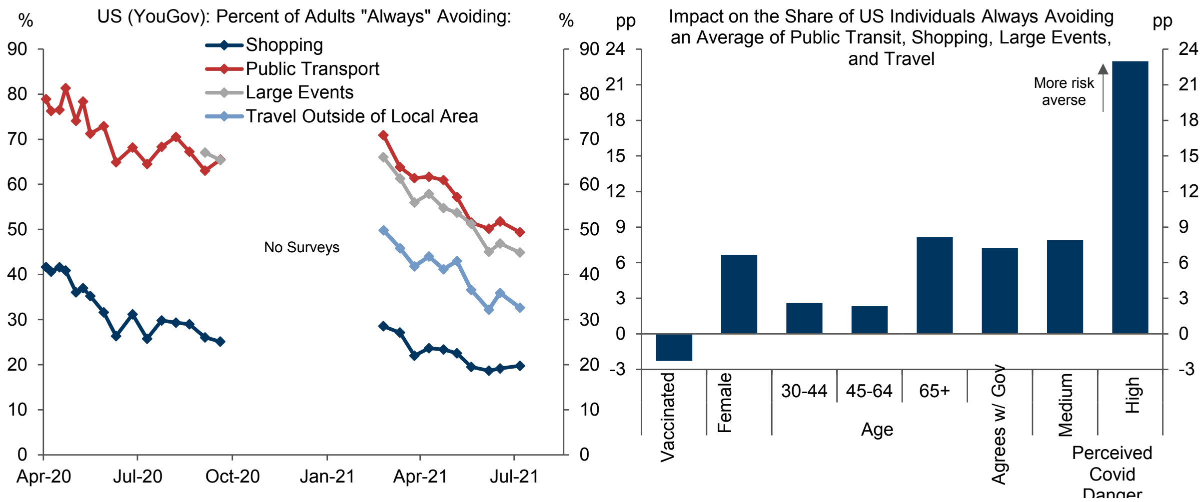
On the medical side, the more transmissible and somewhat more evasive Delta strain implies a slower recovery because of renewed outbreaks.[4] Renewed outbreaks have already imposed fairly large drags on growth in several low vaccination economies, including India, Malaysia, South Africa, and Australia. The Delta strain should, however, only weigh modestly on growth in countries with high vaccination rates and containment strategies through consumer risk aversion, labor supply softness, and travel restrictions. We expect that the vaccine-driven ELI improvements over the next year will not be a straight line. We see a fairly high probability that either winter seasonality, some waning in immunity, or a somewhat more transmissible/evasive future strain lead to another episode of modest ELI tightening.

On the economic side, the concentration of the remaining weakness in services spending among individuals, sectors, and countries with a higher exposure or aversion to virus risk suggests that the remainder of the recovery will be more gradual.

While most individuals in highly vaccinated economies appear comfortable returning to high-contact services, some are still reluctant. The share of Americans reporting to "always avoid" high-contact activities has decreased but remains substantial at around 50% for public transportation and large events, and 30% for travel (Exhibit 5, left panel). Although vaccinations have a statistically significant negative impact on individuals' aversion to high-contact activities, demographic factors and perceptions about Covid appear to have a larger impact (right panel). A further recovery will require not only rising vaccinations and related medical improvements, but also time for individuals to become more comfortable. Incorporating more persistent consumer caution, and a slow recovery of the office-adjacent economy, our US economists have lowered the H2 consumption growth forecast by 2pp.

[4] Full theoretical herd immunity is unlikely to be reached based on the very high basic reproduction rate, vaccine hesitancy, and protection levels against infections from vaccines or prior infections that are not very elevated and diminish over time.

Exhibit 5: Many Americans Still Avoid High-Contact Activities

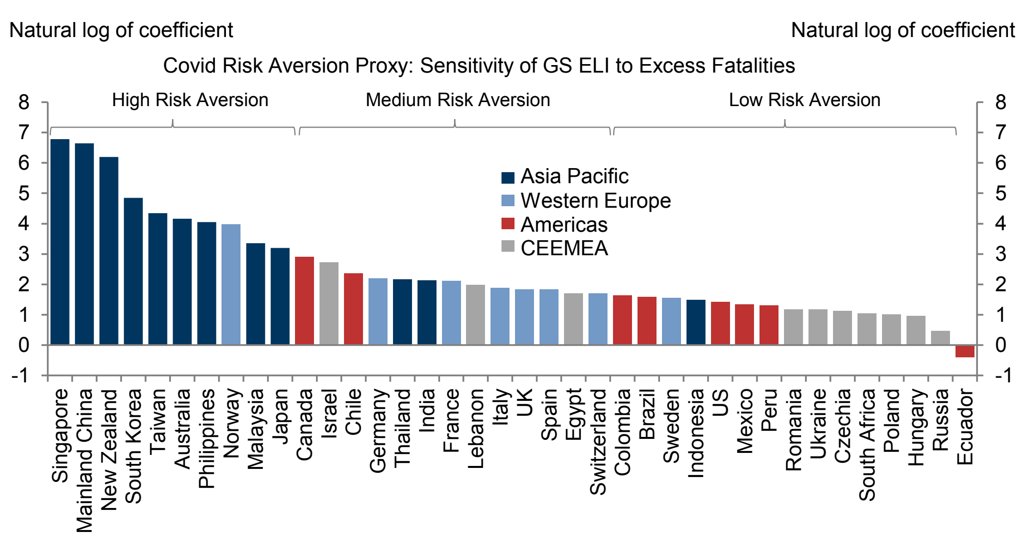


Regression combines the last four samples (late May-early July), and uses ages 18-29, disagreeing with government, and low perceived Covid danger as reference groups.

Source: YouGov, Goldman Sachs Global Investment Research

Looking across countries, differences in immunity rates, risk attitudes, and economic structures also imply an uneven and more gradual next phase of the recovery. Exhibit 6 shows the sensitivity of the ELI to excess fatalities as a measure of Covid risk aversion. We identify countries with high risk aversion (e.g. China, Australia, and Japan), moderate risk aversion (e.g. Canada, the EU, the UK, and India), and low risk aversion (e.g. Brazil, Sweden, the US, and Russia). China's high risk aversion could keep quarantines and travel controls in place for longer, and delay the recovery in tourism economies such as Vietnam, Thailand, and Singapore.

Exhibit 6: Higher Risk Aversion to Covid in Asia-Pacific



We regress the 7-day moving average (7DMA) ELI on contemporaneous 7DMA estimated excess fatalities.

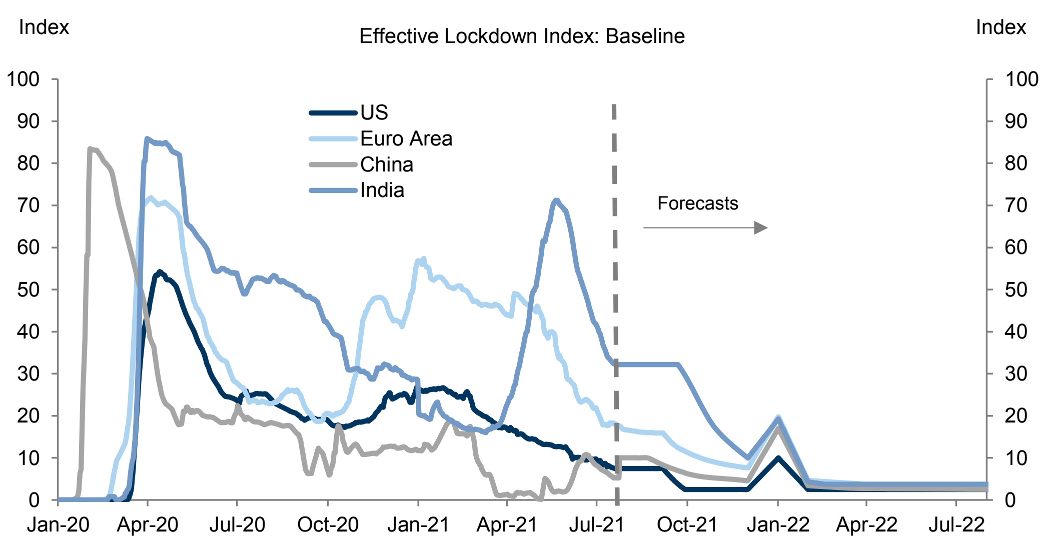
Source: Goldman Sachs Global Investment Research

A Diminishing Reopening Boost

We next estimate reopening impulses to growth in a baseline and a downside scenario. We first construct baseline ELI paths, shown in Exhibit 7, in three steps:

1. **End point.** We assume that the steady state ELI level and the time to get there depend on a country's immunity and Covid risk aversion (Exhibit 6). To illustrate, we assume the US will reach an ELI of 2.5 in September this year, but that Australia will only come down to 5 in 2022Q2.
2. **Shape.** We model the ELI trajectory between its current level and the end point using our immunity timelines and the immunity-ELI relationship from Exhibit 2.[5]
3. **Year-end wave.** We incorporate another episode of modest-to-moderate ELI tightening through the turn of the year, where the peak ELI depends on historical ELI tightening, a country's immunity, and its risk aversion.

Exhibit 7: We Assume Substantial Further ELI Easing

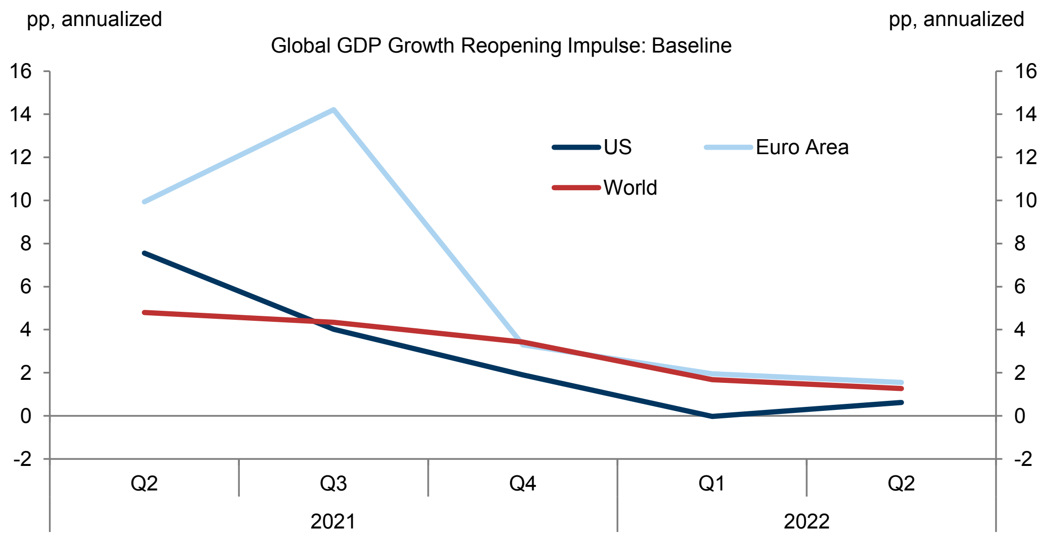


Source: Goldman Sachs Global Investment Research

Exhibit 8 shows our baseline reopening impulses to quarterly annualized growth. The global reopening impulse slows from 5pp in Q2-Q3 to 3pp in Q4, and just above 1pp in 2022H1. Our H2 reopening impulse is larger in the Euro Area than in the US, where much of the expected progress is behind us.

5 We also incorporate adjustments for countries where cases are currently rising (e.g. a flat ELI for the next 45 days in the US in Exhibit 7) and based on inputs from our country economists (e.g. a flat ELI for the next 60 days in India).

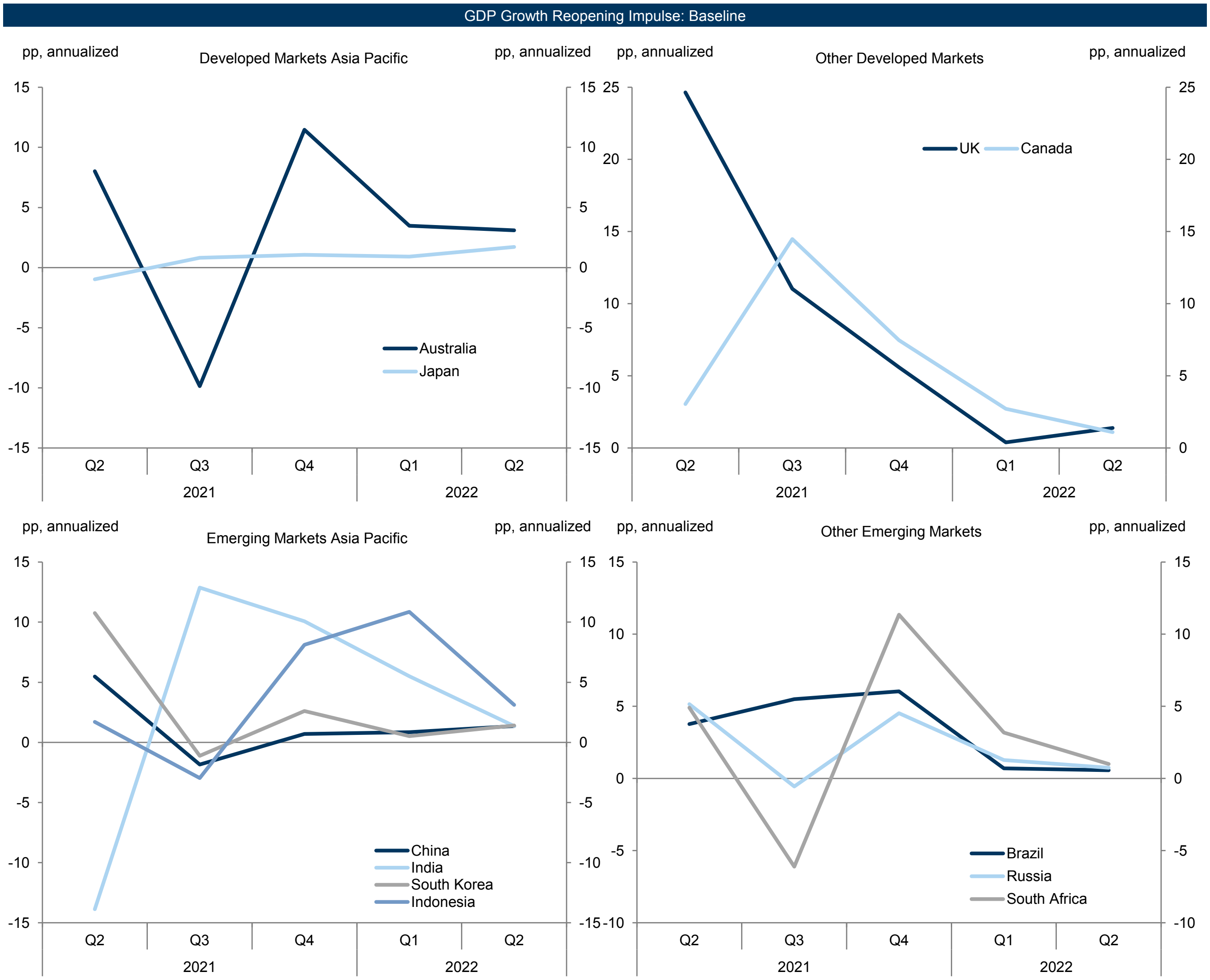
Exhibit 8: The Reopening Impulse to Global Growth Slows From 5pp in Q2-Q3 to 1pp in 2022H1



Source: Goldman Sachs Global Investment Research

We also estimate large Q3 reopening impulses in India, Canada, and the UK, where our ELIs have recently eased sharply (Exhibit 9). In contrast, we estimate reopening impulses that are negative in Q3 for Australia, South Africa, and Indonesia, but turn positive in Q4. Our impulses are small in China from Q3 onwards given the fairly complete recovery in the ELI and domestic activity.

Exhibit 9: We Estimate Large Positive Reopening Impulses in Q3 in India and Canada

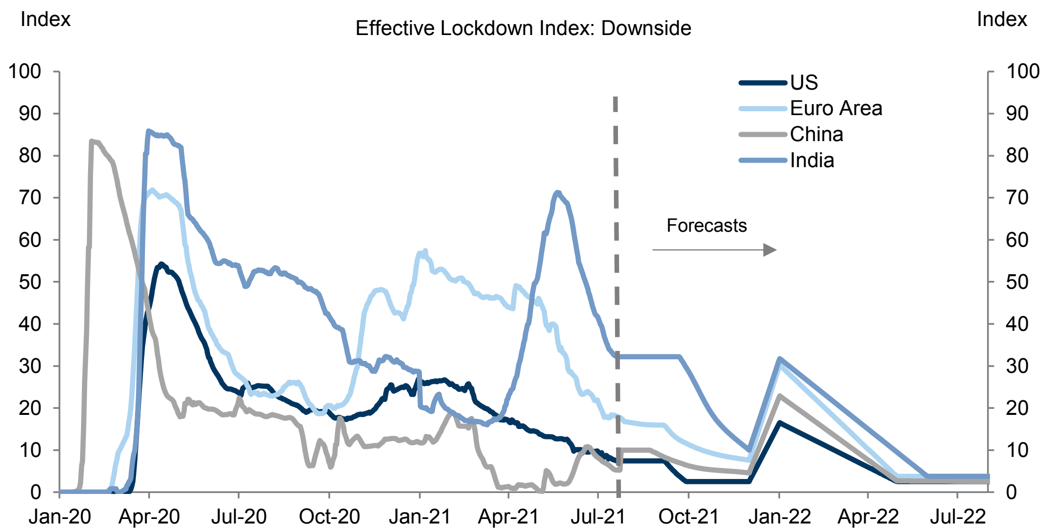


Source: Goldman Sachs Global Investment Research

Downside Risks to Reopening

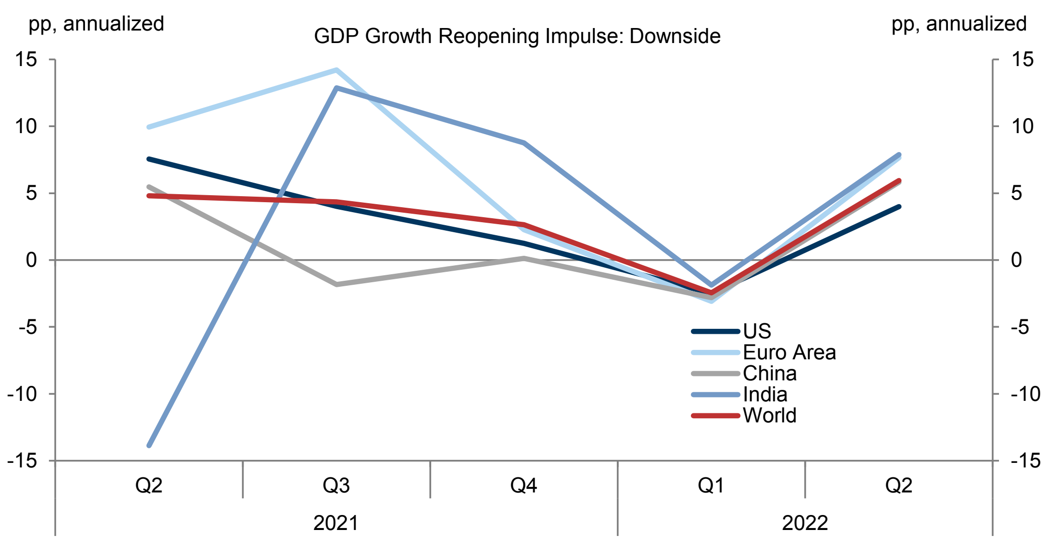
We next analyze a downside scenario where the ELI tightens more substantially around year-end, for instance due to waning immunity or some vaccine escape, and then eases only gradually early next year (see Exhibit 10 and Appendix 1). Relative to our baseline, this downside scenario reduces the global reopening impulse by 1pp to 2½pp in Q4 and by 4pp to –2½pp in Q1, but boosts the impulse by 5pp to 6pp in Q2 (Exhibit 11).

Exhibit 10: Illustrative Downside Scenarios for the ELI



Source: Goldman Sachs Global Investment Research

Exhibit 11: In a Downside Scenario, the Global Reopening Impulse Turns Negative in Q1



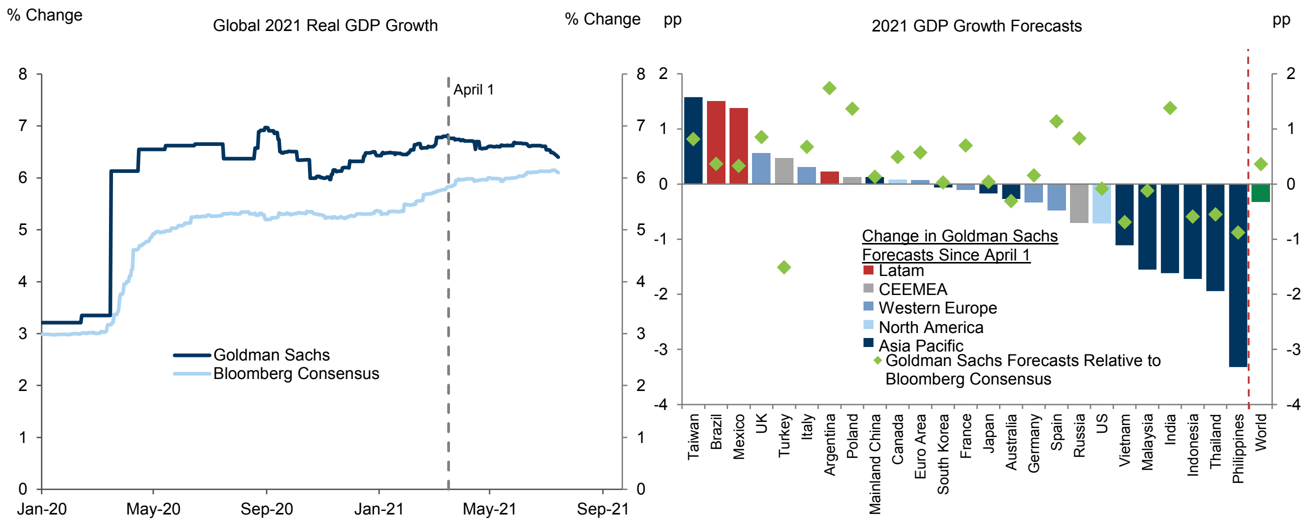
Source: Goldman Sachs Global Investment Research

Still Constructive but More Selectively Bullish

The global reopening outlook has turned less bright since the emergence of the Delta strain and India's terrible second wave. Since April 1st, the gap between our 2021 global growth forecast and the median consensus forecast has narrowed from 1pp to 0.3pp. As the left panel of Exhibit 12 shows, this reflects consensus upgrades but more recently also downgrades to our own estimate now at 6.4%.

Among the 25 largest economies we cover and since April 1st, we have made relatively large downgrades to 2021 growth in the low-vaccination Southern Asian economies of India, Indonesia, and Malaysia (all -1½pp), and bigger downgrades to Thailand (-2pp) and the Philippines (-3½pp), which face the additional drag of weak international tourism (right panel). We have also downgraded our US growth forecast by around ½pp over this period, reflecting a more cautious consumption outlook and bottlenecks in the goods and housing sectors. On the positive side, we have lifted our Brazil and Mexico 2021 forecasts by 1½pp because, in contrast with Asia-Pacific, we estimate that they have now reached relatively high immunity levels and that activity has become increasingly insensitive to Covid.

Exhibit 12: The Gap Between Our 2021 Global Growth Forecast and the Consensus View Has Narrowed; Still Above Consensus in Economies with Lots of Room for Reopening, Such as India and Spain



Source: Bloomberg, Goldman Sachs Global Investment Research

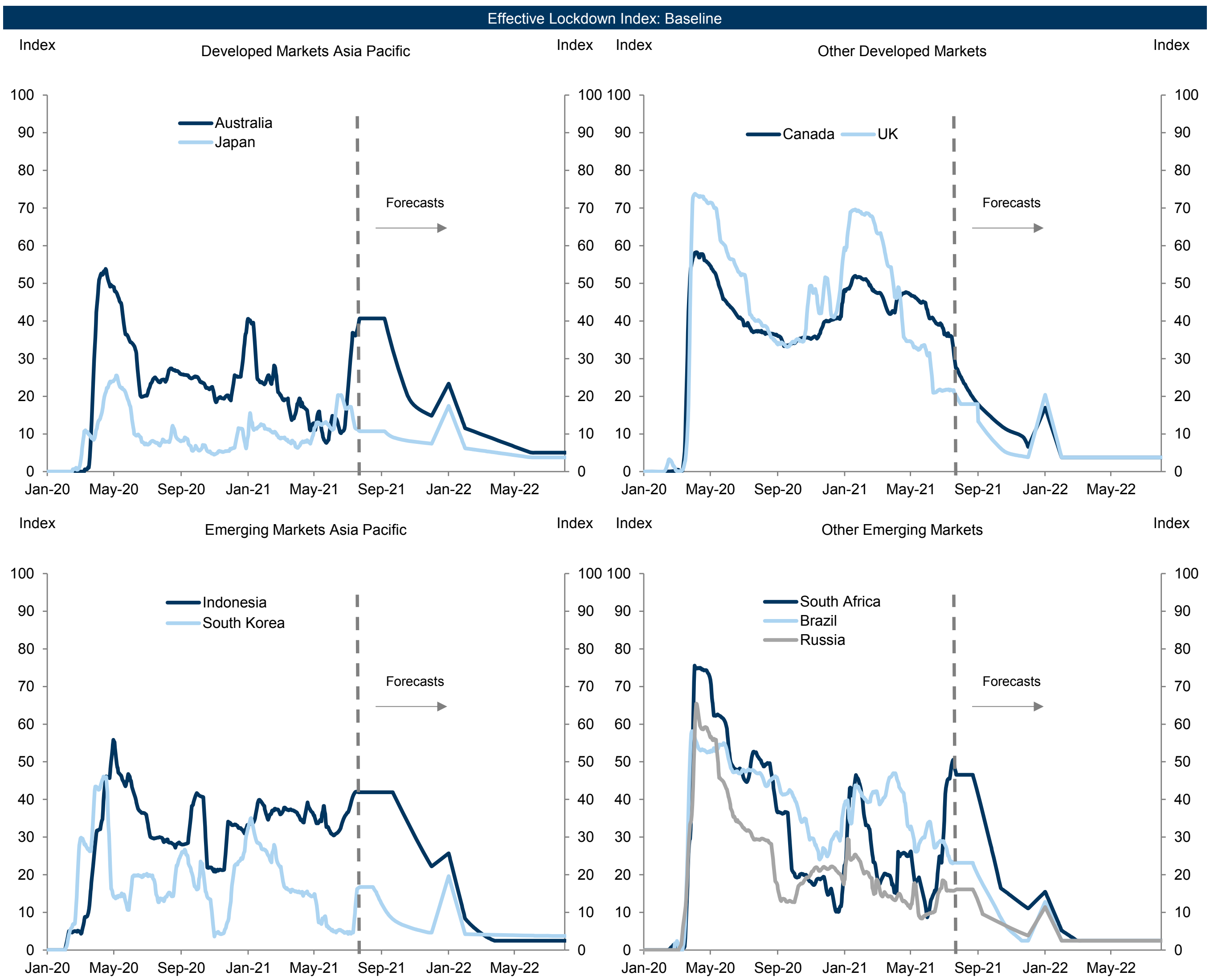
Our growth forecasts now mainly differ from consensus expectations by above-consensus 2021 views in economies with lots of room for reopening, such as India (+1½pp above consensus) and Spain (+1pp), and the sharpness of the US deceleration that we expect over the next year and a half on the back of a declining reopening impulse and a negative fiscal impulse.

Daan Struyven

Sid Bhushan

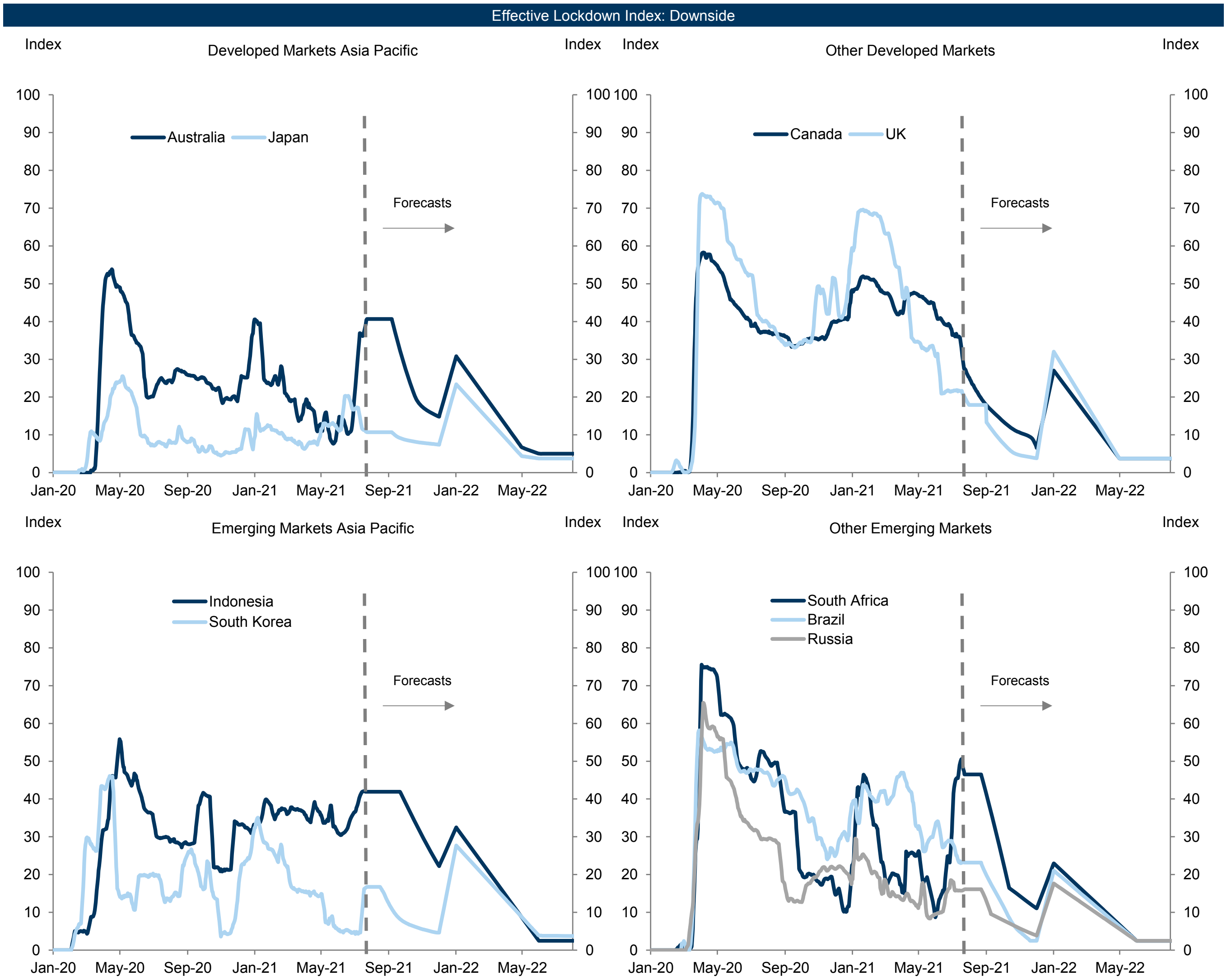
Appendix

Baseline ELI Paths



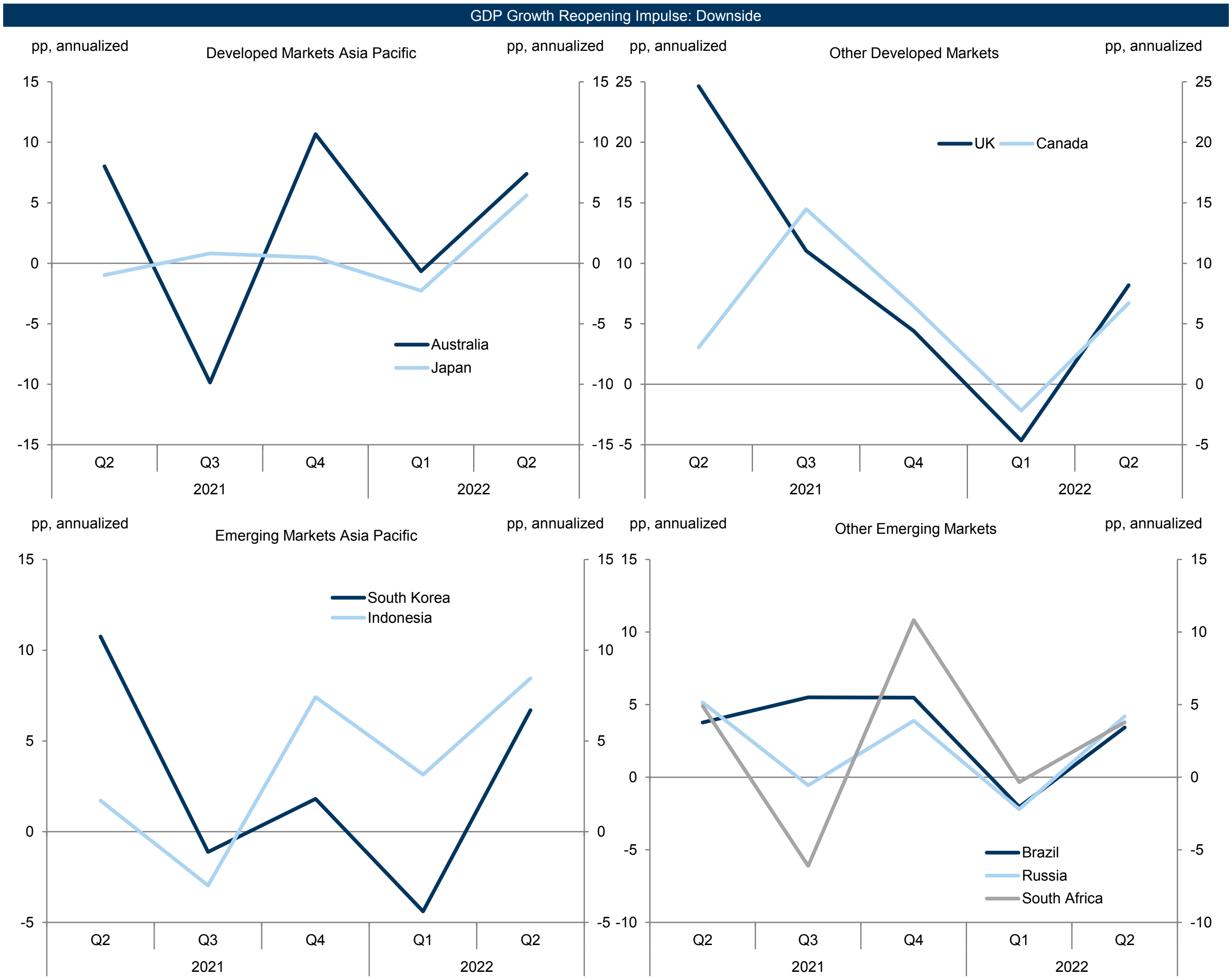
Source: Goldman Sachs Global Investment Research

Downside ELI Paths



Source: Goldman Sachs Global Investment Research

Exhibit 13: Downside GDP Growth Reopening Impulses



Source: Goldman Sachs Global Investment Research

Disclosure Appendix

Reg AC

We, Jan Hatzius, Daan Struyven, Sid Bhushan and Daniel Milo, hereby certify that all of the views expressed in this report accurately reflect our personal views, which have not been influenced by considerations of the firm's business or client relationships.

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

Disclosures

Regulatory disclosures

Disclosures required by United States laws and regulations

See company-specific regulatory disclosures above for any of the following disclosures required as to companies referred to in this report: manager or co-manager in a pending transaction; 1% or other ownership; compensation for certain services; types of client relationships; managed/co-managed public offerings in prior periods; directorships; for equity securities, market making and/or specialist role. Goldman Sachs trades or may trade as a principal in debt securities (or in related derivatives) of issuers discussed in this report.

The following are additional required disclosures: **Ownership and material conflicts of interest:** Goldman Sachs policy prohibits its analysts, professionals reporting to analysts and members of their households from owning securities of any company in the analyst's area of coverage. **Analyst compensation:** Analysts are paid in part based on the profitability of Goldman Sachs, which includes investment banking revenues. **Analyst as officer or director:** Goldman Sachs policy generally prohibits its analysts, persons reporting to analysts or members of their households from serving as an officer, director or advisor of any company in the analyst's area of coverage. **Non-U.S. Analysts:** Non-U.S. analysts may not be associated persons of Goldman Sachs & Co. LLC and therefore may not be subject to FINRA Rule 2241 or FINRA Rule 2242 restrictions on communications with subject company, public appearances and trading securities held by the analysts.

Additional disclosures required under the laws and regulations of jurisdictions other than the United States

The following disclosures are those required by the jurisdiction indicated, except to the extent already made above pursuant to United States laws and regulations. **Australia:** Goldman Sachs Australia Pty Ltd and its affiliates are not authorised deposit-taking institutions (as that term is defined in the Banking Act 1959 (Cth)) in Australia and do not provide banking services, nor carry on a banking business, in Australia. This research, and any access to it, is intended only for "wholesale clients" within the meaning of the Australian Corporations Act, unless otherwise agreed by Goldman Sachs. In producing research reports, members of the Global Investment Research Division of Goldman Sachs Australia may attend site visits and other meetings hosted by the companies and other entities which are the subject of its research reports. In some instances the costs of such site visits or meetings may be met in part or in whole by the issuers concerned if Goldman Sachs Australia considers it is appropriate and reasonable in the specific circumstances relating to the site visit or meeting. To the extent that the contents of this document contains any financial product advice, it is general advice only and has been prepared by Goldman Sachs without taking into account a client's objectives, financial situation or needs. A client should, before acting on any such advice, consider the appropriateness of the advice having regard to the client's own objectives, financial situation and needs. A copy of certain Goldman Sachs Australia and New Zealand disclosure of interests and a copy of Goldman Sachs' Australian Sell-Side Research Independence Policy Statement are available at: https://www.goldmansachs.com/disclosures/australia-new-zealand/index.html. **Brazil:** Disclosure information in relation to CVM Resolution n. 20 is available at https://www.gs.com/worldwide/brazil/area/gir/index.html. Where applicable, the Brazil-registered analyst primarily responsible for the content of this research report, as defined in Article 20 of CVM Resolution n. 20, is the first author named at the beginning of this report, unless indicated otherwise at the end of the text. **Canada:** Goldman Sachs Canada Inc. is an affiliate of The Goldman Sachs Group Inc. and therefore is included in the company specific disclosures relating to Goldman Sachs (as defined above). Goldman Sachs Canada Inc. has approved of, and agreed to take responsibility for, this research report in Canada if and to the extent that Goldman Sachs Canada Inc. disseminates this research report to its clients. **Hong Kong:** Further information on the securities of covered companies referred to in this research may be obtained on request from Goldman Sachs (Asia) L.L.C. **India:** Further information on the subject company or companies referred to in this research may be obtained from Goldman Sachs (India) Securities Private Limited, Research Analyst - SEBI Registration Number INH000001493, 951-A, Rational House, Appasaheb Marathe Marg, Prabhadevi, Mumbai 400 025, India, Corporate Identity Number U74140MH2006FTC160634, Phone +91 22 6616 9000, Fax +91 22 6616 9001. Goldman Sachs may beneficially own 1% or more of the securities (as such term is defined in clause 2 (h) the Indian Securities Contracts (Regulation) Act, 1956) of the subject company or companies referred to in this research report. **Japan:** See below. **Korea:** This research, and any access to it, is intended only for "professional investors" within the meaning of the Financial Services and Capital Markets Act, unless otherwise agreed by Goldman Sachs. Further information on the subject company or companies referred to in this research may be obtained from Goldman Sachs (Asia) L.L.C., Seoul Branch. **New Zealand:** Goldman Sachs New Zealand Limited and its affiliates are neither "registered banks" nor "deposit takers" (as defined in the Reserve Bank of New Zealand Act 1989) in New Zealand. This research, and any access to it, is intended for "wholesale clients" (as defined in the Financial Advisers Act 2008) unless otherwise agreed by Goldman Sachs. A copy of certain Goldman Sachs Australia and New Zealand disclosure of interests is available at: https://www.goldmansachs.com/disclosures/australia-new-zealand/index.html. **Russia:** Research reports distributed in the Russian Federation are not advertising as defined in the Russian legislation, but are information and analysis not having product promotion as their main purpose and do not provide appraisal within the meaning of the Russian legislation on appraisal activity. Research reports do not constitute a personalized investment recommendation as defined in Russian laws and regulations, are not addressed to a specific client, and are prepared without analyzing the financial circumstances, investment profiles or risk profiles of clients. Goldman Sachs assumes no responsibility for any investment decisions that may be taken by a client or any other person based on this research report. **Singapore:** Goldman Sachs (Singapore) Pte. (Company Number: 198602165W), which is regulated by the Monetary Authority of Singapore, accepts legal responsibility for this research, and should be contacted with respect to any matters arising from, or in connection with, this research. **Taiwan:** This material is for reference only and must not be reprinted without permission. Investors should carefully consider their own investment risk. Investment results are the responsibility of the individual investor. **United Kingdom:** Persons who would be categorized as retail clients in the United Kingdom, as such term is defined in the rules of the Financial Conduct Authority, should read this research in conjunction with prior Goldman Sachs research on the covered companies referred to herein and should refer to the risk warnings that have been sent to them by Goldman Sachs International. A copy of these risks warnings, and a glossary of certain financial terms used in this report, are available from Goldman Sachs International on request.

European Union and United Kingdom: Disclosure information in relation to Article 6 (2) of the European Commission Delegated Regulation (EU) (2016/958) supplementing Regulation (EU) No 596/2014 of the European Parliament and of the Council (including as that Delegated Regulation is implemented into United Kingdom domestic law and regulation following the United Kingdom's departure from the European Union and the European Economic Area) with regard to regulatory technical standards for the technical arrangements for objective presentation of investment recommendations or other information recommending or suggesting an investment strategy and for disclosure of particular interests or indications of conflicts of interest is available at https://www.gs.com/disclosures/europeanpolicy.html which states the European Policy for Managing Conflicts of Interest in Connection with Investment Research.

Japan: Goldman Sachs Japan Co., Ltd. is a Financial Instrument Dealer registered with the Kanto Financial Bureau under registration number Kinsho

69, and a member of Japan Securities Dealers Association, Financial Futures Association of Japan and Type II Financial Instruments Firms Association. Sales and purchase of equities are subject to commission pre-determined with clients plus consumption tax. See company-specific disclosures as to any applicable disclosures required by Japanese stock exchanges, the Japanese Securities Dealers Association or the Japanese Securities Finance Company.

Global product; distributing entities

The Global Investment Research Division of Goldman Sachs produces and distributes research products for clients of Goldman Sachs on a global basis. Analysts based in Goldman Sachs offices around the world produce research on industries and companies, and research on macroeconomics, currencies, commodities and portfolio strategy. This research is disseminated in Australia by Goldman Sachs Australia Pty Ltd (ABN 21 006 797 897); in Brazil by Goldman Sachs do Brasil Corretora de Títulos e Valores Mobiliários S.A.; Public Communication Channel Goldman Sachs Brazil: 0800 727 5764 and / or contatogoldmanbrasil@gs.com. Available Weekdays (except holidays), from 9am to 6pm. Canal de Comunicação com o Público Goldman Sachs Brasil: 0800 727 5764 e/ou contatogoldmanbrasil@gs.com. Horário de funcionamento: segunda-feira à sexta-feira (exceto feriados), das 9h às 18h; in Canada by either Goldman Sachs Canada Inc. or Goldman Sachs & Co. LLC; in Hong Kong by Goldman Sachs (Asia) L.L.C.; in India by Goldman Sachs (India) Securities Private Ltd.; in Japan by Goldman Sachs Japan Co., Ltd.; in the Republic of Korea by Goldman Sachs (Asia) L.L.C., Seoul Branch; in New Zealand by Goldman Sachs New Zealand Limited; in Russia by OOO Goldman Sachs; in Singapore by Goldman Sachs (Singapore) Pte. (Company Number: 198602165W); and in the United States of America by Goldman Sachs & Co. LLC. Goldman Sachs International has approved this research in connection with its distribution in the United Kingdom.

Effective from the date of the United Kingdom's departure from the European Union and the European Economic Area ("Brexit Day") the following information with respect to distributing entities will apply:

Goldman Sachs International ("GSI"), authorised by the Prudential Regulation Authority ("PRA") and regulated by the Financial Conduct Authority ("FCA") and the PRA, has approved this research in connection with its distribution in the United Kingdom.

European Economic Area: GSI, authorised by the PRA and regulated by the FCA and the PRA, disseminates research in the following jurisdictions within the European Economic Area: the Grand Duchy of Luxembourg, Italy, the Kingdom of Belgium, the Kingdom of Denmark, the Kingdom of Norway, the Republic of Finland, Portugal, the Republic of Cyprus and the Republic of Ireland; GS -Succursale de Paris (Paris branch) which, from Brexit Day, will be authorised by the French Autorité de contrôle prudentiel et de resolution ("ACPR") and regulated by the Autorité de contrôle prudentiel et de resolution and the Autorité des marches financiers ("AMF") disseminates research in France; GSI - Sucursal en España (Madrid branch) authorized in Spain by the Comisión Nacional del Mercado de Valores disseminates research in the Kingdom of Spain; GSI - Sweden Bankfilial (Stockholm branch) is authorized by the SFSA as a "third country branch" in accordance with Chapter 4, Section 4 of the Swedish Securities and Market Act (Sw. lag (2007:528) om värdepappersmarknaden) disseminates research in the Kingdom of Sweden; Goldman Sachs Bank Europe SE ("GSBE") is a credit institution incorporated in Germany and, within the Single Supervisory Mechanism, subject to direct prudential supervision by the European Central Bank and in other respects supervised by German Federal Financial Supervisory Authority (Bundesanstalt für Finanzdienstleistungsaufsicht, BaFin) and Deutsche Bundesbank and disseminates research in the Federal Republic of Germany and those jurisdictions within the European Economic Area where GSI is not authorised to disseminate research and additionally, GSBE, Copenhagen Branch filial af GSBE, Tyskland, supervised by the Danish Financial Authority disseminates research in the Kingdom of Denmark; GSBE - Sucursal en España (Madrid branch) subject (to a limited extent) to local supervision by the Bank of Spain disseminates research in the Kingdom of Spain; GSBE - Succursale Italia (Milan branch) to the relevant applicable extent, subject to local supervision by the Bank of Italy (Banca d'Italia) and the Italian Companies and Exchange Commission (Commissione Nazionale per le Società e la Borsa "Consob") disseminates research in Italy; GSBE - Succursale de Paris (Paris branch), supervised by the AMF and by the ACPR disseminates research in France; and GSBE - Sweden Bankfilial (Stockholm branch), to a limited extent, subject to local supervision by the Swedish Financial Supervisory Authority (Finansinpektionen) disseminates research in the Kingdom of Sweden.

General disclosures

This research is for our clients only. Other than disclosures relating to Goldman Sachs, this research is based on current public information that we consider reliable, but we do not represent it is accurate or complete, and it should not be relied on as such. The information, opinions, estimates and forecasts contained herein are as of the date hereof and are subject to change without prior notification. We seek to update our research as appropriate, but various regulations may prevent us from doing so. Other than certain industry reports published on a periodic basis, the large majority of reports are published at irregular intervals as appropriate in the analyst's judgment.

Goldman Sachs conducts a global full-service, integrated investment banking, investment management, and brokerage business. We have investment banking and other business relationships with a substantial percentage of the companies covered by our Global Investment Research Division. Goldman Sachs & Co. LLC, the United States broker dealer, is a member of SIPC (https://www.sipc.org).

Our salespeople, traders, and other professionals may provide oral or written market commentary or trading strategies to our clients and principal trading desks that reflect opinions that are contrary to the opinions expressed in this research. Our asset management area, principal trading desks and investing businesses may make investment decisions that are inconsistent with the recommendations or views expressed in this research.

We and our affiliates, officers, directors, and employees, will from time to time have long or short positions in, act as principal in, and buy or sell, the securities or derivatives, if any, referred to in this research, unless otherwise prohibited by regulation or Goldman Sachs policy.

The views attributed to third party presenters at Goldman Sachs arranged conferences, including individuals from other parts of Goldman Sachs, do not necessarily reflect those of Global Investment Research and are not an official view of Goldman Sachs.

Any third party referenced herein, including any salespeople, traders and other professionals or members of their household, may have positions in the products mentioned that are inconsistent with the views expressed by analysts named in this report.

This research is focused on investment themes across markets, industries and sectors. It does not attempt to distinguish between the prospects or performance of, or provide analysis of, individual companies within any industry or sector we describe.

Any trading recommendation in this research relating to an equity or credit security or securities within an industry or sector is reflective of the investment theme being discussed and is not a recommendation of any such security in isolation.

This research is not an offer to sell or the solicitation of an offer to buy any security in any jurisdiction where such an offer or solicitation would be illegal. It does not constitute a personal recommendation or take into account the particular investment objectives, financial situations, or needs of individual clients. Clients should consider whether any advice or recommendation in this research is suitable for their particular circumstances and, if appropriate, seek professional advice, including tax advice. The price and value of investments referred to in this research and the income from them may fluctuate. Past performance is not a guide to future performance, future returns are not guaranteed, and a loss of original capital may occur. Fluctuations in exchange rates could have adverse effects on the value or price of, or income derived from, certain investments.

Certain transactions, including those involving futures, options, and other derivatives, give rise to substantial risk and are not suitable for all investors. Investors should review current options and futures disclosure documents which are available from Goldman Sachs sales representatives or at https://www.theocc.com/about/publications/character-risks.jsp and https://www.fiadocumentation.org/fia/regulatory-disclosures_1/fia-uniform-futures-and-options-on-futures-risk-disclosures-booklet-pdf-version-2018. Transaction costs may be significant in option strategies calling for multiple purchase and sales of options such as spreads. Supporting documentation will be supplied upon request.

Differing Levels of Service provided by Global Investment Research: The level and types of services provided to you by the Global Investment Research division of GS may vary as compared to that provided to internal and other external clients of GS, depending on various factors including your individual preferences as to the frequency and manner of receiving communication, your risk profile and investment focus and perspective (e.g., marketwide, sector specific, long term, short term), the size and scope of your overall client relationship with GS, and legal and regulatory constraints. As an example, certain clients may request to receive notifications when research on specific securities is published, and certain clients may request that specific data underlying analysts' fundamental analysis available on our internal client websites be delivered to them electronically through data feeds or otherwise. No change to an analyst's fundamental research views (e.g., ratings, price targets, or material changes to earnings estimates for equity securities), will be communicated to any client prior to inclusion of such information in a research report broadly disseminated through electronic publication to our internal client websites or through other means, as necessary, to all clients who are entitled to receive such reports.

All research reports are disseminated and available to all clients simultaneously through electronic publication to our internal client websites. Not all research content is redistributed to our clients or available to third-party aggregators, nor is Goldman Sachs responsible for the redistribution of our research by third party aggregators. For research, models or other data related to one or more securities, markets or asset classes (including related services) that may be available to you, please contact your GS representative or go to https://research.gs.com.

Disclosure information is also available at https://www.gs.com/research/hedge.html or from Research Compliance, 200 West Street, New York, NY 10282.