Global value chains: trends, drivers and role in the propagation of recent shocks

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Outline

➢ Motivation

➢ Recent developments

➢ Drivers of GVC trade: a panel-based assessment

➢ GVCs in the international transmission of shocks: Recent experiences

➢ Conclusions

Why is it important to analyse GVCs?

➢ Commentators highlight a **slowdown in GVC integration** after the GFC (e.g. ECB IRC report 2016, WTO 2017, WB 2020)

➢ Still, **production remains highly fragmented across countries**

➢ Rising vertical integration can serve to accelerate and magnify the **transmission of shocks** across countries. GVCs also have important implications in the context of **price formation**.

➢ Key for policymakers to monitor the evolution of GVC trade and understand the forces behind it

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➢ GVC trade defined in line with Borin and Mancini (2019) *'all the traded items that cross at least two international borders'*

Recent Developments

GVCs have receded…contributing to dampen the trade elasticity

Participation in GVCs: a new tracker
(share of gross exports)
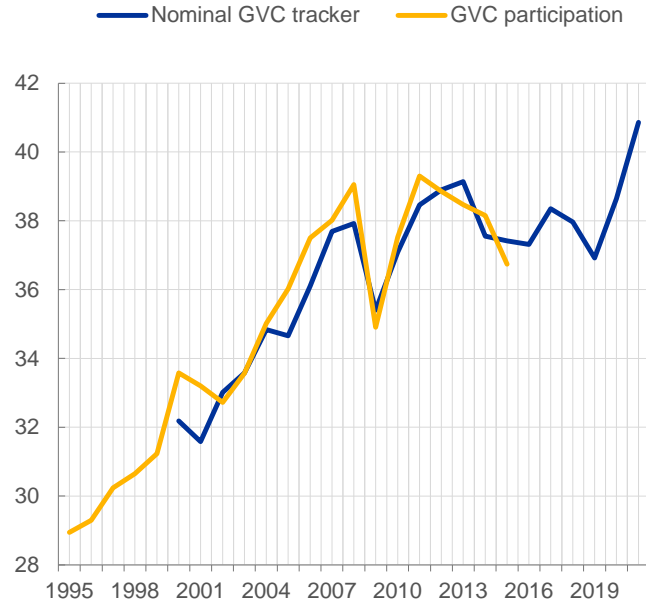
Source: OECD, TDM and ECB computations. Notes: For the period 1995-2015, the yellow line represents GVC participation calculated as the sum of backward and forward participation. The index was extended backward following the methodology proposed by Johnson (2018). The blue line represents a tracker of GVCs built on the basis of selected data on intermediate goods trade. The blue dot refers to average global GVC participation in the first two months of 2021.

Contributions to the income elasticity of world trade
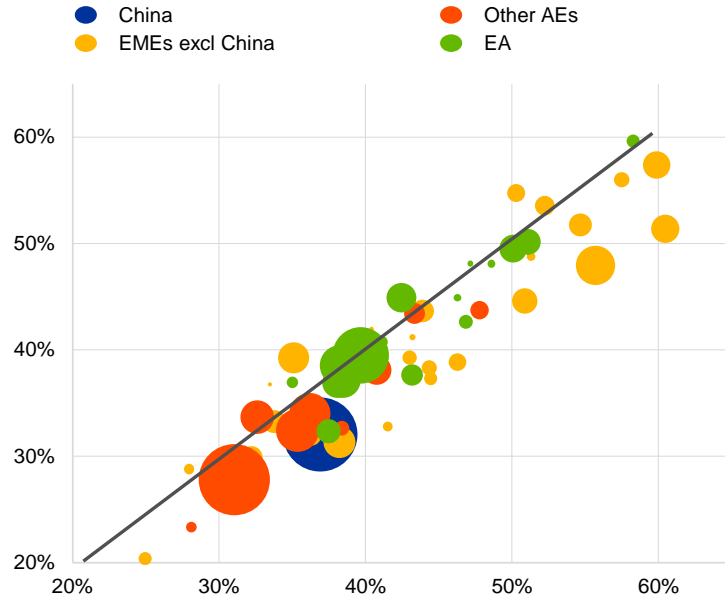### (Trade income elasticities and contributions)
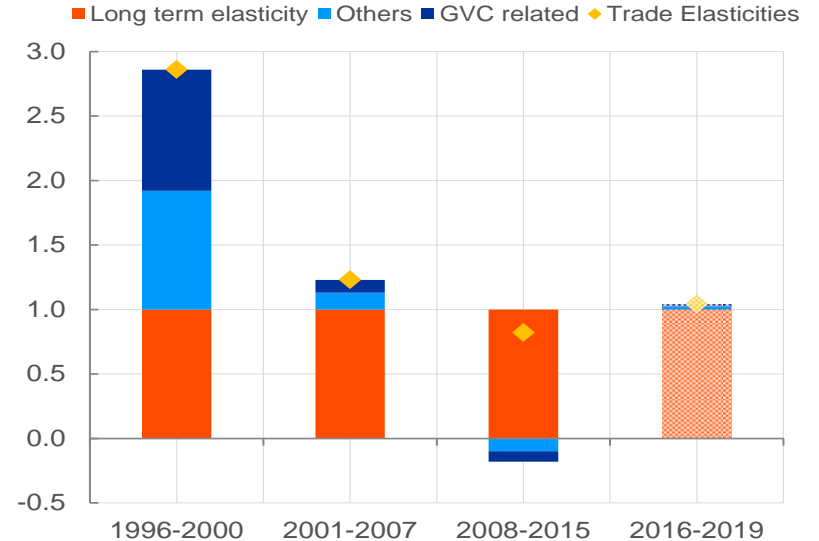
Source: ECB computations. Notes: The decomposition is based on the methodology proposed by Borin and Mancini in the ECB IRC Task Force Report (2016)

The decline in GVC participation widespread across countries and sectors…
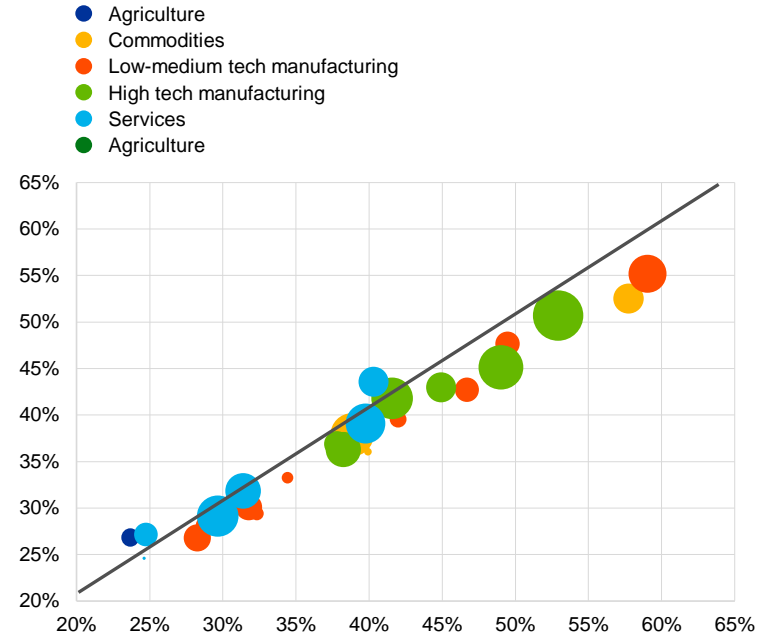
GVC participation by countries
(x axis:2008; y axis:2015; shares of gross exports)

Legend:
- China
- EMEs excl China
- Other AEs
- EA

GVC participation by sectors
(x axis:2008; y axis:2015; shares of gross exports)

Legend:
- Agriculture
- Commodities
- Low-medium tech manufacturing
- High tech manufacturing
- Services
- Agriculture

Source: OECD, and ECB computations. Notes: the size of the bubbles refers to the 2015 country shares of gross exports.
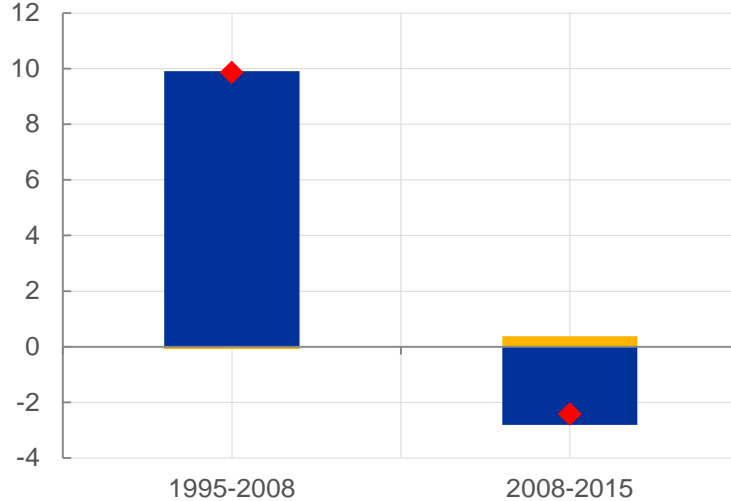
Source: OECD, TDM and ECB computations.
Notes: the size of the bubbles refers to the 2015 country shares of gross exports

Composition effects (sectorial) account for half of the slowdown

Contributions to GVC participation
(percent, pp)

■ Geographical compositional effects
■ GVC intensity
◆ Changes in GVC participation

Source: OECD and ECB computations. Notes: The chart shows contributions to GVC participation over two sub-periods. Compositional effects related to changes in country shares of exports, while GVC intensity relates to changes in countries GVC intensity of gross exports

Contributions to GVC participation
(percent, pp)

■ Sectoral compositional effects   ■ GVC intensity
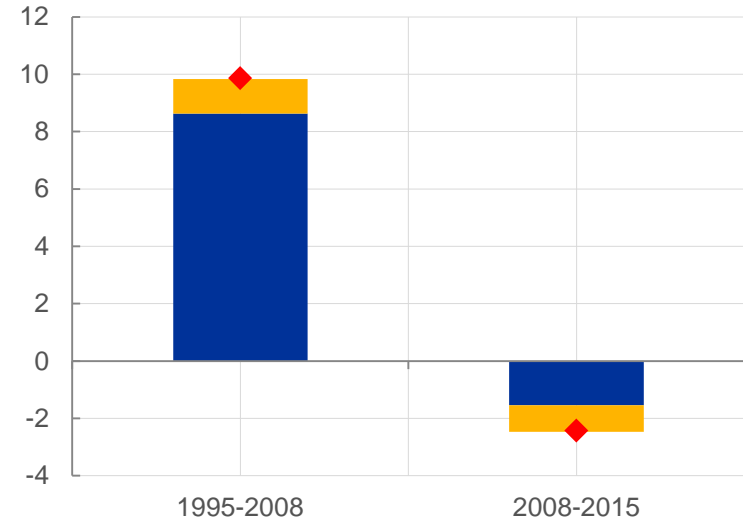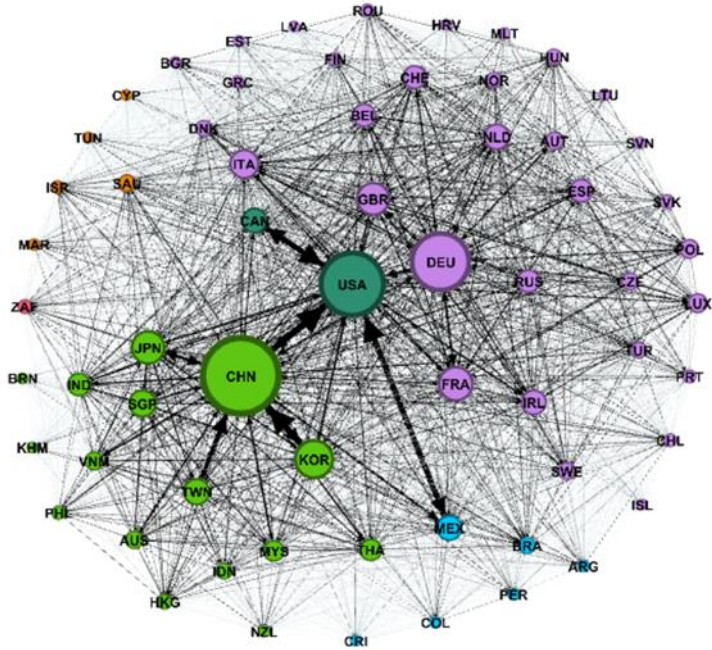◆ Change in GVC participation

Source: OECD and ECB computations. Notes: The chart shows contributions to GVC participation over two sub-periods. Compositional effects related to changes in country shares of exports, while GVC intensity relates to changes in sectors GVC intensity of gross exports

GVCs maintain a strong regional component/hub-spokes structure

Global Value Chain Network in 2015

Contributions to GVC participation
(percent of total regional participation)

■ Regional   ■ Extra-regional
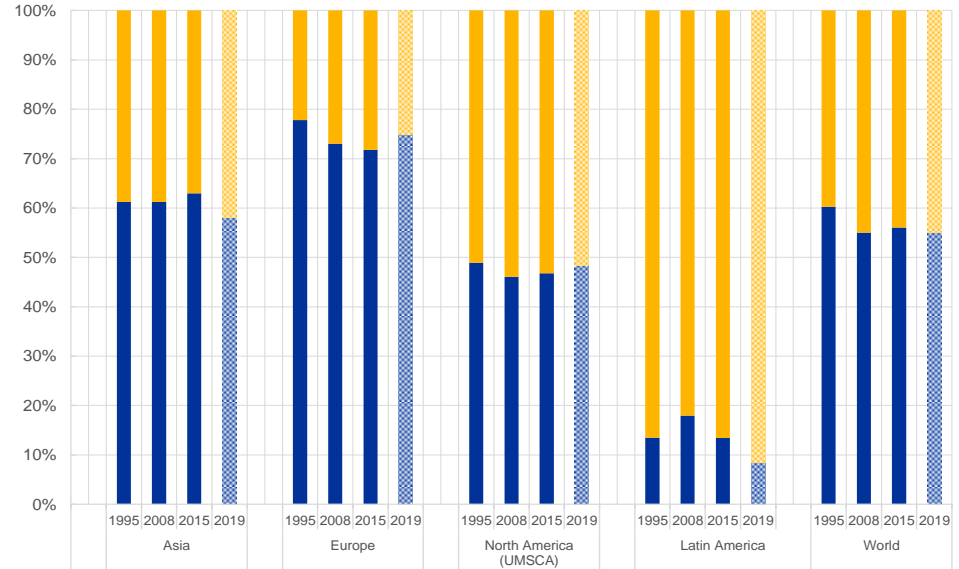
Source: ECB computations Notes: Nodes represent countries involved in GVCs, with the size reflecting the size of GVC trade (both backward and forward) intermediated by each country. Edges refer to the magnitude of GVC trade intermediated by each county pair

Drivers of GVC Participation: a panel assessment

Drivers of GVC participation

➢ Baldwin (2006) and Antras (2020) ascribe the fast growth of vertical integration to a combination of policy measures and technological advancements

➢ The literature also highlights the role of countries' structural characteristics and institutional factors (Kowalski et al. 2015, Antras 2021)

➢ Productivity and cost differentials across countries are also an important determinant of firms' decisions to offshore parts of the production process

➢ Many of the factors that enabled fast GVC integration since the first unbundling likely to have worked in reverse in the last decade, contributing to the decline observed in the data

Drivers of GVCs participation: A panel assessment

- ➢ Structural gravity equation in a GVC set-up
- ➢ Two stages procedure

Importer perspective (j)

$$VA_{ijt} = \beta_1 PTA_{ijt} + \beta_2 tariff_{ijt} + \beta_3 FDI_{ijt} + \beta_4 Z_{ij} + \eta_{it} + \eta_{jt} + \varepsilon_{ijt} \quad (1)$$

$$\eta_{jt} = \alpha X_{j,t} + \varepsilon_{it} \quad (2)$$

VA_{ijt} = value added of i embedded in exports to j that is further re-exported

η_{it}, η_{jt} = origin and destination time fixed effects

Z_{ij} = gravity variables(common border, common language, distance)

$X_{j,t}$ = destination specific variables (including economic, policies and institutional variables)

Estimated coefficients from panel regression in equation 1

	Bilateral gross exports (GEX)		Bilateral traditional trade (GEX - GVC fw)	
VA of i re-exported by j	(1)	(2)	(1)	(2)
FDI outflow (i to j)	0.091***	0.094***	0.088***	0.091***
	(0.010)	(0.012)	(0.010)	(0.012)
Average tariff rate	-0.058***		-0.067***	
	(0.017)		(0.017)	
PTA level		0.225**		0.196**
		(0.106)		(0.103)
Common border (1=yes, 0=no)	0.183***	0.121***	0.177***	0.110***
	(0.090)	(0.083)	(0.089)	(0.083)
Common language (1=yes, 0=no)	0.484***	0.443***	0.476***	0.450***
	(0.081)	(0.116)	(0.077)	(0.114)
Weighted distance (pop-wt, km)	-0.857***	-0.852***	-0.855***	-0.859***
	(0.031)	(0.058)	(0.031)	(0.057)
Observations	11,691	7,163	11,691	7,163
R-squared	0.586	0.359	0.598	0.370

Estimated coefficients from panel regression in equation 2

Importer (j) fixed effect	(1)	(2)	(3)
Economic variables			
Manufacturing output (% of GDP)	0.538***	0.487***	-0.079*
	(0.038)	(0.048)	(0.043)
GDP per capita	0.039	0.109**	-0.044
	(0.034)	(0.046)	(0.038)
GDP	0.657***	0.588***	0.853***
	(0.011)	(0.016)	(0.011)
Unit labour cost (index, 1990=100)	-0.348***	-0.075	-0.086*
	(0.044)	(0.054)	(0.052)
Institutional variables			
Rule of Law (index)	-0.026	0.210***	0.207***
	(0.022)	(0.029)	(0.029)
Days to open a business	-0.011	-0.021***	-0.001
	(0.007)	(0.008)	(0.009)
Policy variables			
Profit Tax (% of GDP)	-0.032***	-0.017***	0.064***
	(0.005)	(0.006)	(0.007)
Market capitalization (% of GDP)	0.040***	0.019**	0.067***
	(0.007)	(0.008)	(0.009)
Education (% of GDP spent on education)	0.313***	0.116**	0.064
	(0.044)	(0.051)	(0.053)
R&D (% of GDP)	-0.107***	-0.039	-0.222***
	(0.022)	(0.026)	(0.027)
Observations	2,069	1,615	1,615
R-squared	0.92	0.83	0.97

Source: ECB computations.

Notes: $p<0.01$ ***; $p<0.05$ - **; $p<0.10$ *; standard errors in brackets. The regression is estimated
using annual data for a panel of 57 countries over the period 1995-
fixed effects from equation 1 (specifications 2 and 3) are regressed
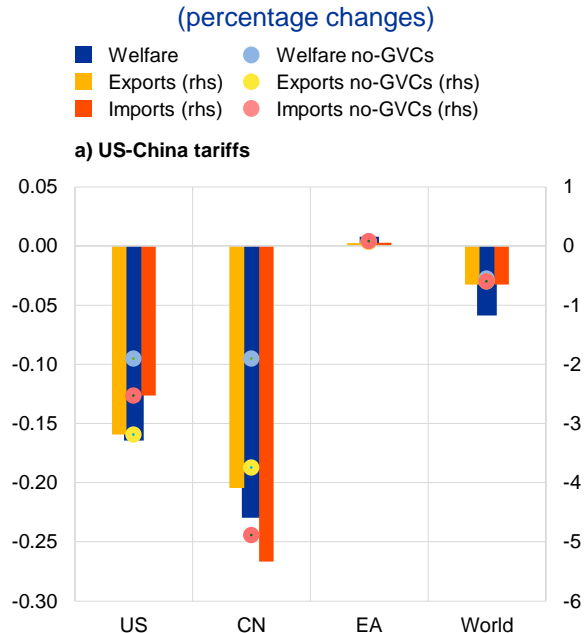economic, policy and institutional variables.

The role of GVCs in the international transmission of shocks: Recent experiences

The role of GVC in the international transmission of shocks: Some theory

➢ Traditional models neglects supply chain linkages

➢ But trade in intermediates matters a great extent for the relation between demand, trade (imports and exports) and production…

➢ And for the international transmission of trade, demand and supply shocks (IMF 2019, Boehm et al. 2015)

➢ **Demand shocks** can be passed up the value chain to input suppliers through a 'bullwhip effect' (Alexandria et al 2012)

➢ **Supply shocks** are passed down the value chain (Acemoglu et al. 2012)

➢ **Shocks to trade costs** (tariffs and non-tariffs barriers) cumulate though the value chain

The role of GVCs in the propagation of trade cost shocks: An application to the US-China trade war

Amplification effects of trade cost shocks via GVCs-chart 16 only trade war part

(percentage changes)

- ■ Welfare
- ● Welfare no-GVCs
- ■ Exports (rhs)
- ● Exports no-GVCs (rhs)
- ■ Imports (rhs)
- ● Imports no-GVCs (rhs)

a) US-China tariffs

- • Multi-country, multi-sector general equilibrium model (Antràs and Chor, 2018, Cappariello et al. 2019)

- • Trade in final and intermediate products

- • GVC effects: model with intermediate trade vs model without intermediate trade

- • **-> tariff effects are amplified** by 70% in the US and by three times in China

Source: World Input-Output Database 2016, WTO Integrated Database, ITC Market Access Map, Comtrade, Felbermayr et al. (2017) and authors' calculations. Notes: For the euro area, the weighted average of Member States is reported. Welfare is measured as real household income. Product-level tariffs have been aggregated to the ISIC Rev. 4 sectoral breakdown. The dots show the effects without GVC-related trade. Panel a: effects from a scenario in which tariffs between the United States and China increase according to the officially published lists.

GVCs as amplifiers of the Covid shock: A Panel assessment

To which extent exports of country/industry upstream to China have performed worse than downstream suppliers?

$$EXP \ of \ intermediate_{i,s,t}$$
$$= \beta_0 + \beta_1 upstreamness \ to \ CHN_{i,s} + \textcolor{red}{\beta_2} upstreamness \ to \ CHN_{i,s} * Covid19$$
$$+ \beta_{3,4,5} \ EXP \ of \ intermediate_{t-1,t-2,t-3} + \gamma_i + \gamma_s + \gamma_t + \varepsilon_{i,s,t}$$

- **EXP**=Yearly exports of intermediates of country i in sector s
- **Upstreamness to China:** Index obtained by measuring the number of intermediate production stages for each country/industry export pair before being consumed in China (Ferrari, 2019)
- **Covid-19**: dummy which take the value 1 in February 2020 (i.e. a proxy for the Covid-19 shock)
- $\gamma_i, \gamma_{ind}, \gamma_{time}$: Country, sector and time fixed effects
- **Data**: Monthly data for the period January 2017-February 2020, available for 37 countries and 22 industries

GVCs as amplifiers of the Covid shock: A Panel assessment

Dependent variable: total country exports growth of intermediate	i	ii	iii	iv
	Overall	By region		
	Weighted	Asia	Nafta	Europe
index of upstreamness to China	0.004	0.021**	0.002	-0.029**
	(0.004)	(0.010)	(0.012)	(0.012)
Covid-19 dummy*index of upstreamness to China	-0.038***	-0.055***	-0.019	0.001
	(0.008)	(0.018)	(0.014)	(0.015)
lag 1	0.368***	0.404***	0.418***	0.361***
	(0.007)	(0.014)	(0.026)	(0.013)
lag 2	0.141***	0.110***	0.197***	0.148***
	(0.008)	(0.016)	(0.028)	(0.015)
lag 3	0.015**	0.066***	0.009	-0.147***
	(0.007)	(0.013)	(0.026)	(0.013)
Intercept	-0.020	-0.073**	-0.008	0.083**
	(0.012)	(0.031)	(0.039)	(0.040)
Observations	16,607	4,154	1,452	4,553
R2	0.390	0.494	0.594	0.398

Source: ECB calculations. Notes: $p < 0.01$ ***; $p < 0.05$ - **; $p < 0.10$ *; standard errors in brackets. The regression is estimated using the 1-year lagged level of total intermediate exports as analytical weight for the observations. Country, industry and time (monthly) fixed effects are included in the panel regression. We also performed robustness tests by moving the Covid-19 dummy to one year before (February 2019) and observing an insignificant coefficient for the interaction term.

Conclusions

➤ After three decades of continued growth, GVC participation has stalled

➤ Global structural forces that had led to the early rise of GVCs have slowed, contributing to the decline

➤ Impact of recent major shocks on activity and trade likely to have been amplified through the GVC

➤ Risk mitigation concerns related to the COVID-19 pandemic have sparked debates about the reshoring of production

➤ But the pandemic has also the potential to enhance resilience of supply chains.

Background slides