Double-hit scenario of Covid-19 and global value chains

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Abstract
Due to the Covid-19 pandemic, labor force is greatly confined by quarantine (social distancing), and limited units of labor and capital are available at the workplace. Millions of employees have lost their jobs and are facing financial hardships. Likewise, capital owners have become illiquid and possibly insolvent within months. This cycle seems to continue for other factors of production as well. Even after lifting quarantines, the global trade might take months (years) to return to its actual potential. Using the GTAP-VA model, the present study simulates the impact of the double-hit scenario of Covid-19 on the global value chains and identifies production losses in different sectors of the world economy.

Keywords Covid-19 · Economy · Global value chains

1 Introduction
Global trade is rapidly transforming in the coronavirus era. OECD (2020) states that the economic cost of the ongoing pandemic can range between 2.47% (China) to 14.36% (Spain) in terms of gross domestic product (GDP) in the second phase of this pandemic. It will have a devastating impact on the world trade, and there is a need of more robust global supply chains, with more stable bilateral and multilateral trade systems. On the other hand, many global leaders are questioning the role of increasing economic ties beyond the national borders.

Amid growing uncertainty, there is a need to find collective solutions to recover from this ongoing crisis and rebuild a better post-Covid world, which, however, depends on many aspects. For instance, rebuilding such a post-Covid world requires a deeper understanding of trade flows. In the absence of this knowledge, national governments will find it much difficult to reform a more resilient post-pandemic trade era.

The Covid-19 virus grows at the exponential rate, and the rising uncertainty leads to the loss of investment and escalates fluctuations in international trade (Ozili and Arun 2020). Service-oriented economies, particularly dependent on tourism industry, are more affected such as Greece, Spain and Portugal, where the economic losses are even
higher than 15% of GDP (Fernandes 2020). The present crisis is creating a spillover effect throughout supply chains, and countries dependent on global trade face severe economic turbulences.

Over 50% of the global trade occurs in intermediate products, and most of the countries use the foreign goods as inputs to boost their exports (Zeshan 2019). The fragmented production via intermediate products passes through numerous borders, sometimes more than once. Hence, the global economy is steadily shaping in global value chains (GVCs). However, the traditional trade data are limited, unable to assess the original contribution of domestic output in global trade since the value-added content in gross exports of a region does not truly represent total value of gross exports because the gross exports also comprise value-added contribution from various other countries. Further, trade deficit of a nation might get lower if stated in value-added terms instead of gross trade. This phenomenon is much apparent in case of high-tech goods (Xing and Detert 2010); many components of such goods are imported globally where tracing back the actual producer is almost impossible.

To examine the effect of Covid-19 pandemic on global trade, the present study introduces the impact of the Covid-19 pandemic in the GTAP-VA model by reducing the supply of factors of production (such as labor force, capital stock and land rents) caused by the pandemic. More specifically, it simulates the impact of a second outbreak of the pandemic on GVCs in 2020. For this purpose, it uses a global input–output table of 140 regions representing more than 98% of global GDP. Finally, it splits the gross trade flows in domestic and foreign value-added, in direct and indirect value-added from exporting and supporting industries, and in bilateral and multilateral value-added.

The rest of the study is as follows. The research methodology is provided in the next section. Section 3 provides simulation design and data, whereas Sect. 4 describes simulation results. Conclusion and policy recommendations are provided in Sect. 5. Finally, Sect. 6 provides the limitations of this research work.

2 Research methodology

Following the GTAP-VA framework, the following equation describes the value of industry \( j \) in region \( r \), which is equal to the sum of intermediate inputs \( i \) (\( Z_{ij}^r \)) and value-added (\( VA_r^j \)), for details see Antimiani et al. (2018).

\[
VOM_j^r = \sum_i \sum_s Z_{ij}^r + VA_r^j
\]  

(1)

The intermediate inputs can be described as follows:

\[
A_{ij}^s = \frac{Z_{ij}^s}{VOM_j^r}
\]  

(2)

where \( A_{ij}^s \) represents the share of intermediate inputs \( i \) manufactured in region \( s \), consumed by sector \( j \) in country \( r \) in the production process. In a country \( r \), shares of sectoral value-added become:
Double-hit scenario of Covid-19 and global value chains

Further transformation leads to value-added created (in sector \(i\)) in country \(t\), rooted in the exports (\(VXE^{sr}_{j}\)) of the country \(s\) (sector \(j\)) to country \(r\) (\(TVA^{tsr}_{ij}\)) and becomes:

\[
TVA^{tsr}_{ij} = VSH^{Lts}_{ij} \ast VXE^{sr}_{j}
\]

Equation (4) indicates the value-added within the gross traded goods that are rooted in all the inputs acquired locally or imported.

3 Simulation design and dataset

In the current Covid-19 pandemic, labor force is greatly confined by quarantine (social distancing), reducing wages and returns on investment. Thus, less labor and capital units are available at the workplace. Millions of employees have lost their jobs and are facing financial hardship. Likewise, capital owners have become illiquid and possibly insolvent within months. Both labor force and capital stock have reduced, and the link between them is clear. This cycle seems to continue for some time even after lifting quarantines, and the economy might take months (years) to return to its actual potential. In the GTAP-VA model, manufacturers pay land rents to regional households, who own the endowments. Hence, the reducing demand for land shrinks its rent causing a loss of revenue to a regional household during the time of crisis.

The above-mentioned changes are introduced in the GTAP-VA model by reducing levels of factors of production, also known as endowments, such that the loss of GDP in our model is approximately equal to the estimates provided by OECD (2020). Given the odd level of uncertainty triggered by the Covid-19 pandemic, it estimates that impact of a second outbreak of the pandemic on the GDP of all the countries worldwide in the year 2020.

For this purpose, the present study uses the GTAP database version 9 (Aguiar et al. 2016). It combines the input–output tables of all the 140 countries/regions under analysis and links them through trade flows resulting in a global input–output table. All the countries/regions in the database are grouped into 15 countries/regions, and all the sectors are grouped into 10 sectors. The most detailed description of the dataset is provided in “Appendix.”

4 Simulation results

The simulation results indicate that the Covid-19 pandemic has a negative impact on all the sectors of the global economy (Fig. 1). The most affected sectors comprise textiles and clothing, light manufacturing and heavy manufacturing, whereas the most affected countries/regions include Oceania, Nepal, North America, EU_28 and MENA. The production losses in the global economy reduce the welfare level and the GDP worldwide. The highest losses are witnesses in EU_28 and North America (Fig. 2), where welfare and GDP losses are USD 1517 billion and 10% in EU_28, while the respective losses are 1433 billion and 10% in North America.
Overall, the simulation results reveal that global welfare losses are going to be around 4.6 trillion (5.2% of global GDP), which is consistent with The World Bank (2020). To recover from such huge economic downfall, there is a need to focus on the most devastated sectors of the global economy by strengthen the backward and forward production linkages. It can be done through a timely and targeted fiscal stimulus in a coordinated way where suitable public resources can be employed to healthcare sector as well as to economic sectors. Besides, there is a need to provide extra liquidity to the small and medium labor-intensive enterprises.

The production losses caused by the Covid-19 pandemic disrupt global trade. Nearly 50% of the world trade occurs in intermediate imports as most of the countries use foreign intermediate inputs in exporting industries. Decomposing the gross trade flows in local and overseas value-added contents describes a clear picture of the world economy. Hence, gross trade is divided into several types of value-added contents such as domestic contribution (DVA), foreign contribution (FVA),\(^1\) direct domestic contribution from exporting industries (DVA\(_{dir}\)), indirect contribution from supporting industries (DVA\(_{indir}\)),\(^2\) direct contribution in bilateral (DVA\(_{blt}\)) trade and contribution in multilateral trade (DVA\(_{mlt}\)).\(^3\)

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\(^1\) DVA indicates the domestic contribution in gross domestic exports, whereas the rest comes from FVA.

\(^2\) DVA\(_{dir}\) shows the output generated directly by domestic exporting sector, whereas DVA\(_{indir}\) specifies the output manufactured by domestic supporting industries.

\(^3\) DVA\(_{blt}\) indicates domestic value-added in bilateral exports, whereas DVA\(_{mlt}\) characterizes the value-added content of a country (A) integrated in exports from a third countries (C) to a country (B).
Analysis of DVA indicates that extraction, light manufacturing and heavy manufacturing are the most affected sectors worldwide (Table 3). The extraction sector is affected the most in MENA region where the DVA reduces by around USD 52 billion, while the highest loss to DVA in light manufacturing industry is around 21 billion and 43 billion in East Asian and EU_28. Further, the heavy manufacturing sector bears the highest losses in North America and EU_28, which are 53 billion and 88 billion, respectively. The similar trend is witnessed in case of FVA (Table 4). It specifies that the exporting industry is heavily dependent on both domestic and foreign value-added contents. However, the volume of FVA content is much smaller than the DVA content.

Further analysis of the simulation results indicates that the exporting industries use inputs directly and indirectly from different countries and sectors (Tables 5 and 6). The DVA_dir shows the same pattern as DVA, which portrays that DVA_dir has a high contribution in DVA. Further, DVA_indir shows heavy losses in transport and communication sectors along with the previously mentioned sectors. Hence, many industries are indirectly affected when there is a decrease in DVA due to the Covid-19 pandemic.

The losses to value-added content are quite alarming in the bilateral as well as multilateral trade (Tables 7 and 8). In case of former, EU_28 witnesses the highest loss (199 billion), whereas the South Asian region bears the lowest losses (2.8 billion). Extraction, light manufacturing and heavy manufacturing industries face the highest losses. In case of the latter, MENA region experiences the highest losses, whereas South Asian region experiences the lowest level of losses (2.8 billion). Extraction, heavy manufacturing and other services face the highest losses.

5 Conclusion and discussion

The recent Covid-19 pandemic has challenged the global economy and even triggered a trade war between USA and China. In China, the provinces accountable for more than 90% exports have closed their production units or running at a low production capacity (Sohrabi et al. 2020). However, preparing and in-time viral response standard before the general public might have saved many lives. Millions of workers are out of work because exporting industries face severe barriers.

Rebuilding a better post-Covid world requires a deeper understanding of lost trade flows. In the absence of such knowledge, national governments will face many difficulties to build a more resilient post-pandemic trade era. To examine the impact of Covid-19 pandemic on global trade, the present study simulates how a second outbreak of the Covid-19 pandemic might shake the global value chains in 2020.

Analysis of simulation results indicates that DVA in extraction, light manufacturing and heavy manufacturing export industries are affected the most globally. The extraction sector faces the worst hit in MENA region where the DVA reduces by around USD 52 billion, while the highest loss to DVA in light manufacturing industry is around 21 billion and 43 billion in East Asian and EU_28, respectively. Further, the heavy manufacturing sector bears the highest output losses in North America and EU_28 and the similar trend is witnessed in case of FVA. Exporting sectors use inputs directly from exporting industries and indirectly from supporting industries. In case of export supporting industries, Covid-19 causes heavy losses to transport and communication sectors. Based on the simulation results, the present study suggests the following policy recommendations:
• There is a need of a timely and targeted fiscal stimulus in a coordinated way.
• Direct public resources to healthcare sector as well as to economic sectors.
• Extra liquidity is needed to target small and medium labor-intensive enterprises.
• Develop country specific short-term, medium-term and long-term initiatives for economic stimulus and market stability.

6 Limitations

• This research work employs a static CGE framework for the short-run analysis. However, a dynamic CGE framework can provide a better long-run analysis.
• The (sector and country/region) aggregation schemes offer a convenient way to discuss a global perspective; however, they are less useful for a country specific analysis.

Appendix: aggregation scheme

See Tables 1, 2, 3, 4, 5, 6, 7 and 8.
### Table 1: Regional Aggregation

| S. no. | Code   | Names                              | Description                                                                                     |
|--------|--------|------------------------------------|-------------------------------------------------------------------------------------------------|
| 1      | Oceania| Australia, New Zealand             | Australia, New Zealand, Rest of Oceania                                                        |
| 2      | EastAsia| East Asia                          | China, Hong Kong, Japan, Korea, Mongolia, Taiwan, Rest of East Asia, Brunei Darussalam          |
| 3      | SEAsia | Southeast Asia                     | Cambodia, Indonesia, Lao PDR, Malaysia, Philippines, Singapore, Thailand, Viet Nam, Rest of Southeast Asia |
| 4      | BGD    | Bangladesh                         | Bangladesh                                                                                     |
| 5      | IND    | India                              | India                                                                                          |
| 6      | NPL    | Nepal                              | Nepal                                                                                          |
| 7      | PAK    | Pakistan                           | Pakistan                                                                                       |
| 8      | LKA    | Sri Lanka                          | Sri Lanka                                                                                      |
| 9      | XSA    | Rest of South Asia                 | Rest of South Asia                                                                             |
| 10     | NAmerica| North America                     | Canada, USA, Mexico, Rest of North America                                                     |
| 11     | LatinAmer| Latin America                  | Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Paraguay, Peru, Uruguay, Venezuela, Rest of South America, Costa Rica, Guatemala, Honduras, Nicaragua, Panama, El Salvador, Rest of Central America, Dominican Republic, Jamaica, Puerto Rico, Trinidad and Tobago, Rest of Caribbean |
| 12     | EU_28  | European Union                    | Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, UK, Bulgaria, Croatia, Romania |
| 13     | MENA   | Middle East and North Africa       | Bahrain, Iran, Israel, Jordan, Kuwait, Oman, Qatar, Saudi Arabia, Turkey, United Arab Emirates, Rest of Western Asia, Egypt, Morocco, Tunisia, Rest of North Africa, |
| 14     | SSA    | Sub-Saharan Africa                 | Benin, Burkina Faso, Cameroon, Côte d’Ivoire, Ghana, Guinea, Nigeria, Senegal, Togo, Rest of Western Africa, Rest of Central Africa, South Central Africa, Ethiopia, Kenya, Madagascar, Malawi, Mauritius, Mozambique, Rwanda, Tanzania, Uganda, Zambia, Zimbabwe, Rest of Eastern Africa, Botswana, Namibia, South Africa, Rest of South African Customs Union |
| 15     | ROW    | Rest of World                      | Switzerland, Norway, Rest of European Free Trade Association, Albania, Belarus, Russian Federation, Ukraine, Rest of Eastern Europe, Rest of Europe, Kazakhstan, Kyrgyzstan, Rest of Former Soviet Union, Armenia, Azerbaijan, Georgia, Rest of the World |
| S. no. | Code     | Names                        | Description                                                                                                                                 |
|--------|----------|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| 1      | GrainsCrops | Grains and crops            | Paddy rice, wheat, cereal grains nec, vegetables, fruit, nuts, oil seeds, sugar cane, sugar beet, plant-based fibers, crops nec, processed rice |
| 2      | MeatLstk  | Livestock and meat products | Bovine cattle, sheep and goats, horses, animal products nec, Raw milk, wool, silkworm, cocoons, bovine meat products, meat products nec       |
| 3      | Extraction| Mining and extraction       | Forestry, fishing, coal, oil, gas, minerals nec                                                                                             |
| 4      | ProcFood  | Processed food              | Vegetable oils and fats, dairy products, sugar, food products nec, beverages and tobacco products                                            |
| 5      | TextWapp  | Textiles and clothing        | Textiles, wearing apparel                                                                                                                   |
| 6      | LightMnfc | Light manufacturing         | Leather products, wood products, paper products, publishing, metal products, motor vehicles and parts, transport equipment nec, manufactures nec |
| 7      | HeavyMnfc | Heavy manufacturing         | Petroleum, coal products, chemical, rubber, plastic products, mineral products nec, ferrous metals, metals nec, electronic equipment, machinery and equipment nec |
| 8      | Util_Con  | Utilities and construction  | Electricity, gas manufacture, distribution, water, construction                                                                             |
| 9      | TransComm | Transport and communication | Trade, transport nec, water transport, air transport, communication                                                                          |
| 10     | OthServices | Other services              | Financial services nec, insurance, business services nec, recreational and other services, public administration, defense, education, health, dwellings |
Table 3  Change in domestic value-added (DVA) in gross trade (USD million) (a positive value indicates losses, whereas a negative value indicates gains)

| Oceania | East Asia | SEAsia | Bgd | Ind | Npl | Pak | Sri |
|---------|-----------|--------|-----|-----|-----|-----|-----|
| GrainsCrops | 473 | −303 | 416 | 5 | 732 | −15 | 48 | 92 |
| MeatLstk | 1118 | −8 | 78 | 0 | 301 | −1 | 9 | 1 |
| Extraction | 7830 | 223 | 1237 | 1 | 359 | −4 | 1 | 13 |
| ProcFood | 1252 | 865 | 2438 | 28 | 761 | −3 | 64 | 70 |
| TextWapp | 136 | 6983 | 1525 | 1174 | 2096 | −24 | 1024 | 182 |
| LightMnfc | 1181 | 21,354 | 3013 | 39 | 3023 | −8 | 153 | 37 |
| HeavyMnfc | 4600 | 43,287 | 12,066 | 25 | 4681 | −3 | 179 | 83 |
| Util_Cons | 92 | 1150 | 260 | 2 | 52 | −4 | 5 | 2 |
| TransComm | 2042 | 7561 | 3486 | 19 | 1051 | −8 | 113 | 82 |
| OthServices | 2411 | 7063 | 3463 | 117 | 3832 | −21 | 221 | 41 |

| Xsa | NAmerica | LatinAmer | EU_28 | MENA | SSA | ROW |
|-----|----------|-----------|-------|------|-----|-----|
| GrainsCrops | 3 | 3390 | 2330 | 685 | 278 | 501 | 644 |
| MeatLstk | 1 | 984 | 1264 | 924 | 92 | 90 | 85 |
| Extraction | 10 | 2592 | 9640 | 1425 | 51,992 | 14,034 | 21,266 |
| ProcFood | 4 | 2129 | 4442 | 5432 | 719 | 592 | 1459 |
| TextWapp | 1 | 1053 | 1259 | 4319 | 3218 | 275 | 432 |
| LightMnfc | 2 | 18,962 | 3262 | 42,894 | 4367 | 1253 | 3486 |
| HeavyMnfc | 15 | 53,331 | 13,140 | 87,595 | 23,148 | 4873 | 29,853 |
| Util_Cons | 12 | 955 | 235 | 3096 | 924 | 161 | 1500 |
| TransComm | 25 | 9499 | 3895 | 19,862 | 7062 | 1442 | 4993 |
| OthServices | 24 | 25,658 | 4038 | 32,737 | 6749 | 1511 | 7118 |

Own calculations
Table 4  Change in foreign value-added (FVA) in gross trade (USD million)

| Oceania | East Asia | SEAsia | Bgd | Ind | Npl | Pak | Sri |
|---------|-----------|--------|-----|-----|-----|-----|-----|
| GrainsCrops | 49 | -5 | 71 | 2 | 92 | 0 | 13 | 10 |
| MeatLstk | 130 | 4 | 13 | 0 | 17 | 0 | 1 | 0 |
| Extraction | 639 | 43 | 183 | 0 | 43 | 0 | 0 | 1 |
| ProcFood | 167 | 199 | 635 | 13 | 116 | 0 | 7 | 11 |
| TextWapp | 26 | 1566 | 940 | 515 | 512 | -13 | 295 | 107 |
| LightMnfc | 259 | 5366 | 1601 | 13 | 1206 | -3 | 22 | 30 |
| HeavyMnfc | 1367 | 16,315 | 8464 | 11 | 3820 | -6 | 71 | 81 |
| Util_Cons | 12 | 230 | 95 | 0 | 15 | -1 | 2 | 0 |
| TransComm | 233 | 734 | 812 | 2 | 130 | -2 | 13 | 10 |
| OthServices | 160 | 462 | 487 | 8 | 208 | -3 | 21 | 2 |

| Xsa | NAmerica | LatinAmer | EU_28 | MENA | SSA | ROW |
|-----|----------|-----------|-------|------|-----|-----|
| GrainsCrops | 0 | 387 | 234 | 69 | 38 | 49 | 114 |
| MeatLstk | 0 | 86 | 89 | 91 | 17 | 9 | 16 |
| Extraction | 1 | 157 | 709 | 119 | 3631 | 1568 | 1873 |
| ProcFood | 2 | 229 | 458 | 592 | 196 | 111 | 328 |
| TextWapp | 1 | 190 | 226 | 691 | 946 | 65 | 191 |
| LightMnfc | 1 | 2875 | 573 | 6697 | 1630 | 341 | 1110 |
| HeavyMnfc | 15 | 12,258 | 2726 | 21,519 | 4736 | 1607 | 8850 |
| Util_Cons | 2 | 84 | 27 | 385 | 226 | 36 | 246 |
| TransComm | 3 | 628 | 288 | 1995 | 1032 | 236 | 673 |
| OthServices | 3 | 1062 | 149 | 1634 | 543 | 164 | 653 |

Own calculations
Table 5  Change in direct (DVA\textsubscript{dir}) value-added in domestic value-added (USD million)

|                     | Oceania | East Asia | SEAsia | Bgd | Ind | Npl | Pak | Sri |
|---------------------|---------|-----------|--------|-----|-----|-----|-----|-----|
| GrainsCrops         | 251     | 319       | 1      | 506 | −14 | 15  | 81  |
| MeatLstk            | 568     | 48        | 0      | 204 | −1  | 5   | 1   |
| Extraction          | 5291    | 970       | 0      | 282 | −3  | 0   | 13  |
| ProcFood            | 482     | 1295      | 11     | 254 | −1  | 29  | 47  |
| TextWapp            | 81      | 1076      | 667    | 943 | −12 | 213 | 126 |
| LightMnfc           | 639     | 1819      | 15     | 1565| −3  | 30  | 26  |
| HeavyMnfc           | 1911    | 7748      | 8      | 2451| −2  | 42  | 56  |
| Util\_Cons          | 48      | 145       | 2      | 31  | −2  | 2   | 2   |
| TransComm           | 1347    | 2702      | 17     | 857 | −6  | 98  | 71  |
| OthServices         | 2091    | 2997      | 88     | 3553| −16 | 153 | 34  |

|                     | Xsa | NAmerica | LatinAmer | EU\_28 | MENA | SSA | ROW |
|---------------------|-----|----------|-----------|--------|------|-----|-----|
| GrainsCrops         | 2   | 1421     | 1338      | 375    | 192  | 417 | 423 |
| MeatLstk            | 1   | 372      | 721       | 458    | 54   | 59  | 41  |
| Extraction          | 9   | 1874     | 6768      | 952    | 48,496| 10,934| 14,994|
| ProcFood            | 3   | 979      | 1832      | 2681   | 358  | 261 | 662 |
| TextWapp            | 0   | 581      | 801       | 2560   | 1961 | 125 | 261 |
| LightMnfc           | 1   | 10,561   | 1811      | 23,417 | 2646 | 605 | 1900|
| HeavyMnfc           | 8   | 28,858   | 6701      | 55,198 | 12,118| 2280| 12,745|
| Util\_Cons          | 7   | 557      | 150       | 1807   | 488  | 103 | 892 |
| TransComm           | 22  | 6713     | 2947      | 11,704 | 5322 | 1145| 3869|
| OthServices         | 21  | 22,033   | 3488      | 28,380 | 5817 | 1246| 6024|

Own calculations
| Table 6 | Change in indirect value-added (DVA_indir) in domestic value-added (USD million) |
|---------|--------------------------------------------------------------------------------|
|         | Oceania | East Asia | SEAsia | Bgd  | Ind  | Npl  | Pak  | Sri  |
| GrainsCrops | 130     | 850       | 554    | 78   | 486  | −5   | 90   | 15   |
| MeatLstk   | 170     | 667       | 109    | 4    | 120  | −2   | 36   | 5    |
| Extraction | 995     | 773       | 1327   | 21   | 518  | −1   | 23   | 4    |
| ProcFood   | 88      | 695       | 171    | 8    | 26   | 0    | 37   | 1    |
| TextWapp   | 33      | 556       | 91     | 0    | 26   | −1   | 1    | 1    |
| LightMnfc  | 451     | 2779      | 552    | 16   | 249  | −1   | 16   | 3    |
| HeavyMnfc  | 480     | 5296      | 836    | 18   | 531  | −1   | 30   | 12   |
| Util_Cons  | 798     | 1818      | 574    | 60   | 673  | −1   | 35   | 20   |
| TransComm  | 1913    | 11,009    | 3023   | 356  | 2294 | −12  | 531  | 72   |
| OthServices | 3368    | 11,975    | 1627   | 42   | 1320 | −5   | 432  | 12   |
|           |         |           |        |      |      |      |      |      |
| Xsa       | NAmerica | LatinAmer | EU_28 | MENA | SSA  | ROW  |
| GrainsCrops | 1      | 227       | 918    | 684  | 350  | 195  | 217  |
| MeatLstk   | 1       | 168       | 335    | 496  | 157  | 61   | 141  |
| Extraction | 3       | 6510      | 2428   | 3351 | 8721 | 608  | 7953 |
| ProcFood   | 1       | 398       | 286    | 1336 | 162  | 86   | 215  |
| TextWapp   | 0       | 349       | 144    | 601  | 163  | 56   | 92   |
| LightMnfc  | 1       | 3015      | 1045   | 6587 | 756  | 388  | 1147 |
| HeavyMnfc  | 1       | 4025      | 1643   | 10,018| 2867| 577  | 1269 |
| Util_Cons  | 1       | 3720      | 1126   | 5659 | 1206 | 417  | 3499 |
| TransComm  | 8       | 12,709    | 4976   | 11,097| 3619| 3157 | 8512 |
| OthServices | 6      | 13,484    | 4051   | 31,606| 3097| 2011 | 5977 |

Own calculations
**Table 7** Change in bilateral (DVA_blt) value-added in domestic value-added (USD million)

|                  | Oceania | East Asia | SEAsia | Bgd | Ind | Npl | Pak | Sri |
|------------------|---------|-----------|--------|-----|-----|-----|-----|-----|
| GrainsCrops      | 473     | -303      | 416    | 5   | 732 | -15 | 48  | 92  |
| MeatLstk         | 1118    | -8        | 78     | 0   | 301 | -1  | 9   | 1   |
| Extraction       | 7830    | 223       | 1237   | 1   | 359 | -4  | 1   | 13  |
| ProcFood         | 1252    | 865       | 2438   | 28  | 761 | -3  | 64  | 70  |
| TextWapp         | 136     | 6983      | 1525   | 1174| 2096| -24 | 1024| 182 |
| LightMnfc        | 1181    | 21,354    | 3013   | 39  | 3023| -8  | 153 | 37  |
| HeavyMnfc        | 4600    | 43,287    | 12,066 | 25  | 4681| -3  | 179 | 83  |
| Util_Cons        | 92      | 1150      | 260    | 2   | 52  | -4  | 5   | 2   |
| TransComm        | 2042    | 7561      | 3486   | 19  | 1051| -8  | 113 | 82  |
| OthServices      | 2411    | 7063      | 3463   | 117 | 3832| -21 | 221 | 41  |

|                  | Xsa | NAmerica | LatinAmer | EU_28 | MENA | SSA | ROW |
|------------------|-----|----------|-----------|-------|------|-----|-----|
| GrainsCrops      | 3   | 3390     | 2330      | 685   | 278  | 501 | 644 |
| MeatLstk         | 1   | 984      | 1264      | 924   | 92   | 90  | 85  |
| Extraction       | 10  | 2592     | 9640      | 1425  | 51,992| 14,034| 21,266|
| ProcFood         | 4   | 2129     | 4442      | 5432  | 719  | 592 | 1459|
| TextWapp         | 1   | 1053     | 1259      | 4319  | 3218 | 275 | 432 |
| LightMnfc        | 2   | 18,962   | 3262      | 42,894| 4367 | 1253| 3486|
| HeavyMnfc        | 15  | 53,331   | 13,140    | 87,595| 23,148| 4873| 29,853|
| Util_Cons        | 12  | 955      | 235       | 3096  | 924  | 161 | 1500|
| TransComm        | 25  | 9499     | 3895      | 19,862| 7062 | 1442| 4993|
| OthServices      | 24  | 25,658   | 4038      | 32,737| 6749 | 1511| 7118|

Own calculations
Table 8 Change in multilateral value-added (DVA_mlt) in domestic value-added (USD million)

| Category         | Oceania | East Asia | SEAsia | Bgd | Ind | Npl | Pak | Sri |
|------------------|---------|-----------|--------|-----|-----|-----|-----|-----|
| GrainsCrops      | 71      | 146       | 120    | 8   | 146 | −2  | 17  | 11  |
| MeatLstk         | 86      | 99        | 19     | 0   | 37  | 0   | 5   | 0   |
| Extraction       | 1950    | 229       | 599    | 2   | 177 | −1  | 4   | 4   |
| ProcFood         | 56      | 141       | 100    | 1   | 21  | 0   | 6   | 4   |
| TextWapp         | 22      | 623       | 134    | 56  | 130 | −1  | 30  | 11  |
| LightMnfc        | 181     | 1401      | 285    | 3   | 204 | −1  | 6   | 3   |
| HeavyMnfc        | 556     | 5007      | 1563   | 3   | 559 | −1  | 12  | 12  |
| Util_Cons        | 195     | 328       | 106    | 6   | 110 | 0   | 5   | 3   |
| TransComm        | 578     | 3137      | 1073   | 35  | 541 | −2  | 85  | 17  |
| OthServices      | 996     | 2428      | 575    | 13  | 521 | −2  | 76  | 5   |

| Category         | Xsa     | NAmerica | LatinAmer | EU_28 | MENA | SSA | ROW |
|------------------|---------|----------|-----------|-------|------|-----|-----|
| GrainsCrops      | 1       | 211      | 304       | 89    | 76   | 106 | 76  |
| MeatLstk         | 0       | 53       | 94        | 71    | 20   | 16  | 20  |
| Extraction       | 3       | 1439     | 2302      | 606   | 15,679| 3346| 5051|
| ProcFood         | 0       | 109      | 158       | 263   | 44   | 33  | 73  |
| TextWapp         | 0       | 103      | 66        | 282   | 165  | 23  | 37  |
| LightMnfc        | 0       | 1439     | 368       | 2483  | 386  | 153 | 394 |
| HeavyMnfc        | 1       | 5169     | 1404      | 8544  | 2863 | 635 | 2484|
| Util_Cons        | 1       | 547      | 207       | 752   | 251  | 109 | 696 |
| TransComm        | 5       | 2538     | 1203      | 2974  | 1356 | 846 | 2307|
| OthServices      | 3       | 3806     | 1036      | 5699  | 1060 | 613 | 1659|

Own calculations

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