



Impact of the COVID-19 pandemic on international freight transport in Slovenia and EU

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Abstract

The sudden emergence of COVID-19 and the declaration of a pandemic in the year 2020 has significantly impacted all factors of the economy, including international trade of goods. International freight transport (road, rail, air, and maritime) was also affected. The research analyses the changes in the implementation of international freight transport during the COVID-19 pandemic in EU countries. The main research question was: How did the COVID-19 pandemic impact international freight transport in Slovenia and selected EU member countries? According to the results, we can see that the pandemic outbreak had a different impact on each type of transport. Some modes of transport were more negatively affected by the pandemic than others. In the case of international road freight transport, the pandemic positively affected it (both in Slovenia and at the EU level) since the volume of transported goods increased.

Keywords: International transport, COVID-19, pandemic, freight transport, international trade

1. Introduction

The emergence of the COVID-19 virus has affected all sectors of the economy, including the international transport of goods. China was the first country affected by the impact of COVID-19. Due to the country's role in the global industry, consequences on international logistics spread rapidly worldwide (Marinucci, 2021). Many containment and mitigation measures were taken to flatten this disease's peak, making it difficult to carry out international transport (Nižetić, 2020). Logistics activities were hampered and slowed down, and freight transport suffered severe disruption (Tardivo et al., 2021). One of the measures that made international transport even more difficult was the closure of national borders (Marinucci, 2021). This restriction was accepted by most EU member states, leading to a slowdown in freight transport (Loske, 2020). Slovenia was particularly vulnerable to these restrictions because of its small, open economy.

As the importance of logistics services and transport during the pandemic period was highly considerable (Tardivo et al., 2021), this paper aims to identify the impact of the COVID-19 pandemic on international transport in Slovenia and other EU countries. The timeframe limitation of this research was the period from 2011 to 2021 for 27 EU member countries. The data was analyzed only for freight transport, focusing on the volume of goods transported by international transport from 2011 to 2021. This timeframe enabled us to compare the impact of the pandemic of COVID-19 on international freight transport as a whole and specifically for road, rail, air, and maritime transport in Slovenia and the selected EU countries, which was the main research question of this paper.

The first signs of the impact of the COVID-19 pandemic on freight transport began to show in the early stages, as the supply could not meet the demand, panicked shoppers emptied shelves, and stocks quickly disappeared (Hobbs, 2020). Manufacturers from various industries struggled with material shortages, as deliveries were delayed for several weeks, mainly from China and other parts of the world (Nayak et al., 2021). The pandemic has disrupted various industries and reduced the volume of transported goods (Loske, 2020). Governments worldwide have been forced to take measures to prevent the transmission of the virus (Valderrama, 2021). One of the most outbreaking measures was closing the country's borders, which made struggling with the outbreak of the COVID-19 virus much more difficult (Linka et al., 2020). That also slowed down the freight transport in the Schengen area.

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Limiting transport sector activities caused long-term damage (Nundy et al., 2021). Cui et al. (2021) identified the six most outstanding shocks felt by the transport sector during the pandemic: (1) stoppage of production and service processes, (2) decline in total investment, (3) decline in household consumption, (4) decline in transport demand, (5) closure of transport capacities and (6) increase in protective costs of transport sectors. The results of their research also showed that the outputs of the transport sector were negatively affected by the COVID-19 pandemic. Research by Klein et al. (2022) similarly outlines negative impacts in almost all transport and logistics companies' processes. Distribution and transport networks suffered the consequences due to their sensitivity to the disruptions of labor shortages and movement restrictions, especially long-distance freight transport (Hobbs, 2020). However, some transport companies quickly developed and introduced new protocols to maintain all links in their supply chains (Gray & Torshizi, 2021).

The pandemic also left some positive effects, such as the awareness of the importance of supply chains for the supply of essential food, hygiene, and health products, as well as ensuring the fluidity of transport and the facilitation of border procedures (Marinucci, 2021). It also positively impacted the environment, with fewer emissions and greenhouse gases due to reduced traffic and production, resulting in better air quality during the outbreak. However, this effect did not last long, as after the closure, the situation returned to the old tracks (Tardivo et al., 2021; Borca et al., 2021).

The pandemic has severely affected all forms of transport, from road and rail to air transport (Munawar et al., 2021). International road freight transport experienced several problems in the early part of the pandemic, such as problems with crossing national borders and problems with access to public toilets for drivers (Gray & Torshizi, 2021). The circulation of trucks in road transport remained stable during COVID-19, mainly due to the increase in demand for home deliveries (Munawar et al., 2021). The study on the impact of the COVID-19 disease on road freight transport in China revealed that it affected the increase in road freight transport and also the increase in demand for extensive inventories (Ho et al., 2020). Although national borders were closed, transit for freight vehicles was allowed, although demand for it declined (Munawar et al., 2021; Valderrama, 2021). The pandemic and the measures taken to contain it had a generally low impact on road freight transport. The lockdown positively impacted increasing home deliveries in the long term, thus ensuring that road freight transport remained stable during the pandemic (Laverty et al., 2020; Munawar et al., 2021).

In the initial stages of the pandemic, disruption to rail freight transport was less than to other types of transport (Tardivo et al., 2021). The rail freight transport faced a drop in freight volumes but operated without interruption (Orbanić et al., n.d.). The airline industry was the opposite, highly disrupted by the pandemic, with reduced international and national flights (Valderrama, 2021). Air traffic was restricted and almost wholly stopped shortly after the outbreak (Orbanić et al., n.d.). Sun and coauthors' (2020) findings reveal that the restrictions were imposed mainly on international flights, and the impact was more substantial on international than domestic flights. The aviation industry was the most affected of all forms of transport, as the pandemic also affected economic activities, affecting air transport demand (Munawar et al., 2021; Tardivo et al., 2021; Xuan et al., 2021).

Regarding maritime transport, 46 % of international logistics companies experienced significant delays in shipping cargo from Chinese ports in March 2020. There were also delays in shipping to China; 86 % of companies experienced this delay. 74 % of companies experienced delays in shipment to Europe and 44 % to North America (Tardivo et al., 2021). In the first half of 2020, the pandemic's negative impact was also seen in ship traffic. The research showed that passenger ships were the most affected, while container ships were the second most affected (Millefiori et al., 2021).

2. Methodology

The statistical data from the online platform Eurostat was analyzed to observe the impact of a pandemic on international freight transport in Slovenia and other EU member countries. The analysis was limited to data related to international transport in the EU, which the Eurostat database divides into international loaded and unloaded. For the selected period, the average of goods loaded or unloaded for all 27 EU Member States in 2020 for each year separately was observed. For each mode of transport, the growth rate was separately calculated for goods loaded and unloaded in Slovenia and the EU (more in the Appendix). The growth rate expresses the change in variables over time in percentage terms. It can be positive or negative depending on whether the variables increase or decrease with time. The growth rate is essential for understanding how or how much something changes in a certain period (Chen, 2023).

The chain index was calculated using the equation (Mišić, 2022):

$$I_{\frac{t}{t-1}} = \frac{Y_t}{Y_{t-1}} \times 100 \quad (1)$$

I- index

Y_t occurrence data (the compared value of the occurrence data), which is in the index numerator.

Y_{t-1} occurrence data (the value to compare with) is in the denominator of the index

t period or year considered.

t-1 previous period or year

100 constant

Then, the growth rate was calculated by subtracting 100 from the chain index (Mišić, 2022):

$$S_t = I_{\frac{t}{t-1}} - 100 \quad (2)$$

For the comparison of Slovenia to the EU countries, the percentage of the total goods loaded and unloaded between 2011 and 2021 for Slovenia was calculated separately for each transport type.

3. Results

The analysis of results showed that in 2020, the year of the outbreak of the COVID-19 pandemic, the volumes of international goods varied considerably compared to other years. According to the results, we can agree with Borca, Putz, and Hofbauer (2021) that the pandemic impacted the decline in transported goods. For 2021, the results showed an increase in the volume of international goods.

Table 1 shows the growth rate of goods transported by international transport in Slovenia and the EU. For a better overview of how the COVID-19 pandemic impacted the international transport of goods, the data in Table 1 are shown only for 2020 and 2021.

Table 1. The growth rate of goods transported by international transport in the EU and Slovenia for 2020 and 2021

	Year	EU*		SLO	
		Growth rate loaded (%)	Growth rate unloaded (%)	Growth rate loaded (%)	Growth rate unloaded (%)
Road transport	2020	-2.31	-2.79	5.24	5.51
	2021	6.73	7.33	7.81	9.29
Railway transport	2020	-4.21	-10.17	-16.31	-6.99
	2021	11.21	6.67	8.83	-3.24
Air transport	2020	-14.05	-7.32	-39.81	28.96
	2021	22.77	22.24	15.57	-51.03
Maritime transport**	2020	-7.29		-17.18	
	2021	4.12		9.53	

Source: Author's calculation based on Eurostat data

In 2020, the average volume of goods unloaded and loaded in the EU transported by international road transport decreased. Over ten years, this was the most significant decline for loaded goods (-2.31 %); for unloaded goods, the decline (-2.79 %) of goods was more significant only in 2012 than the decline in 2020.

In Slovenia, the opposite happened, as the amount of goods transported by international road transport increased - the amount of loaded goods by 5.24 % and unloaded goods by 5.51 %.

In the EU, the average volume of goods loaded and unloaded transported by international rail transport decreased in 2020, the most significant decline since 2011. The results show that the decline was more significant in the amount of unloaded goods (-10.17 %) in the EU, meaning that fewer goods arrived in the EU by rail transport than in previous years. In 2021, the volume of goods increased, which can be assumed to be due to the release of measures and the consequent increase in production volumes. In the EU, the volume of goods loaded in 2021 was the highest (+11.21 %), while the volume of goods unloaded was still lower than before the outbreak of the COVID-19 pandemic. In Slovenia, the volume of goods transported by international rail transport also declined in 2020. The volume of goods loaded in Slovenia and transported by international rail transport was the lowest since 2012, in 2020. Our results regarding the decline in the amount of goods in rail transport are consistent with the results of the research by the author Tzvetkov (2021). In percentage terms, the highest decrease (-4.21 %) was observed in 2020 for goods loaded in Slovenia and transported by international rail transport. In 2021, the amount of goods loaded in Slovenia increased again by 11.21 % (but still less than the amount before the outbreak of the COVID-19 pandemic), while the amount of goods unloaded decreased. We can argue that COVID-19 in 2020 harmed international rail transport in Slovenia and the EU based on the results. It can also be argued that in 2021, the impact of the pandemic was still felt, as the volume of goods transported remained lower than before the outbreak.

Slovenia represents a small share of all internationally transported goods by air transport in the EU; as a result, it is also below its average. The average volume of loaded goods transported by international air transport was the lowest in the EU since 2014 in 2020 (-14.05 %). In the same year, the volume of unloaded goods also decreased significantly (by -7.32 %). Over ten years, the EU has seen the most significant decline in the average volume of goods transported by air in 2020. In Slovenia, the only volume decline was in goods loaded (down 39.81%), the most significant decline of any transport mode in 2020. The volume of unloaded goods in Slovenia transported by international air transport increased in 2020 by 28.96 %. Similar to the findings of the author Nižetić (2020), the results of this paper show that the amount of cargo brought to Slovenia increased, and the decrease in the average amount at the EU level was also much smaller than the decrease in the number of goods loaded. Based on the results, we can argue that the pandemic negatively affected the

amount of loaded goods in international air traffic in the EU and Slovenia in 2020, while it positively affected unloaded goods. In 2021, the volume of international goods transported by air to the EU increased, which can be attributed to the relaxation of anti-covid measures and restrictions. Results indicate that air freight transport in the EU has recovered, as the volume increased by more than it decreased in 2020, and the total volume of goods in 2021 is the highest in the entire research period. In Slovenia, the volume of unloaded goods decreased in 2021, possibly due to the relaxation of measures for cheaper transport and the liberalization of passenger transport.

In the EU, from 2011 to 2021, there were three declines in the average volume of goods handled in ports; the largest occurred in 2020 (-7.29 %). During the research period in Slovenia, there was a decrease in handled goods in 2019 (-4.38 %) and 2020 (-17.18 %). Based on the results, it is evident that the pandemic harmed maritime transport in 2020. Similar results indicate a study between ports in Shanghai and the United States (Marinucci, 2021) and a study by Millefiori and coauthors (2021) revealing a negative impact on shipping mobility.

4. Discussion

The results of this research and others (Loske, 2020; Marinucci, 2021; Nayak, 2021) prove that the COVID-19 pandemic substantially impacted the international exchange of goods and caused negative impacts. However, air and sea transport suffered more significant consequences than other types of transport, as the decline in the number of goods was more remarkable in percentage than in other modes of transport. In the EU and Slovenia, international rail transport also suffered significant consequences in 2020.

According to the results, the pandemic outbreak had a different impact on each mode of transport. In the case of international road freight transport, the pandemic positively affected the volume of transported goods in Slovenia and at the EU level. In addition to international road transport, air transport recovered in the EU in 2021, with an increase in the volume of goods, while rail and maritime transport were still feeling the impact of the COVID-19 pandemic in 2021. In Slovenia, the impact of the pandemic on international transport by rail, air, and sea was still felt in 2021, as the volume of goods was lower than before the COVID-19 pandemic.

The researched topic has many possibilities for further research, especially in identifying the long-term consequences that COVID-19 has left on international transport. Since limitation, the results grasp the situation only for freight transport and can not be generalized for passenger transport.

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Appendix

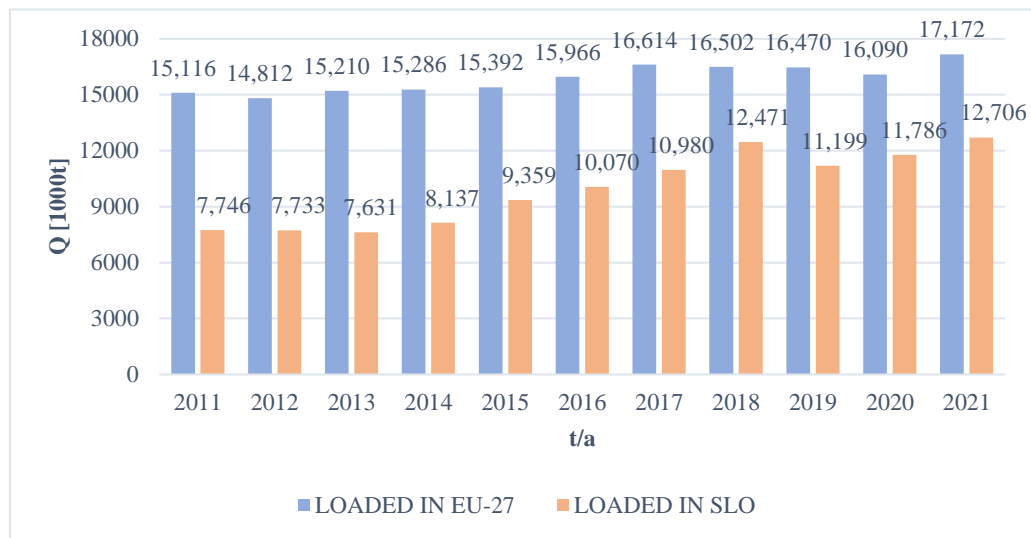
Table A: Loaded and unloaded goods in EU-27 and Slovenia transported by international road transport (in 1000t)

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Loaded in EU-27 [1000t]*	15116,46	14811,54	15210,04	15286,46	15391,88	15965,58	16614,15	16501,96	16469,81	16089,85	17172
Unloaded in EU-27 [1000t]*	12920,38	12443,42	12407	12684,54	12746,27	13007,50	13630,23	13485,65	13350,88	12978,08	13929,69
Loaded in SLO [1000t]	7746	7733	7631	8137	9359	10070	10980	12471	11199	11786	12706
Unloaded in SLO [1000t]	7199	6734	6663	6651	7308	6949	8003	8041	8237	8691	9498

* average

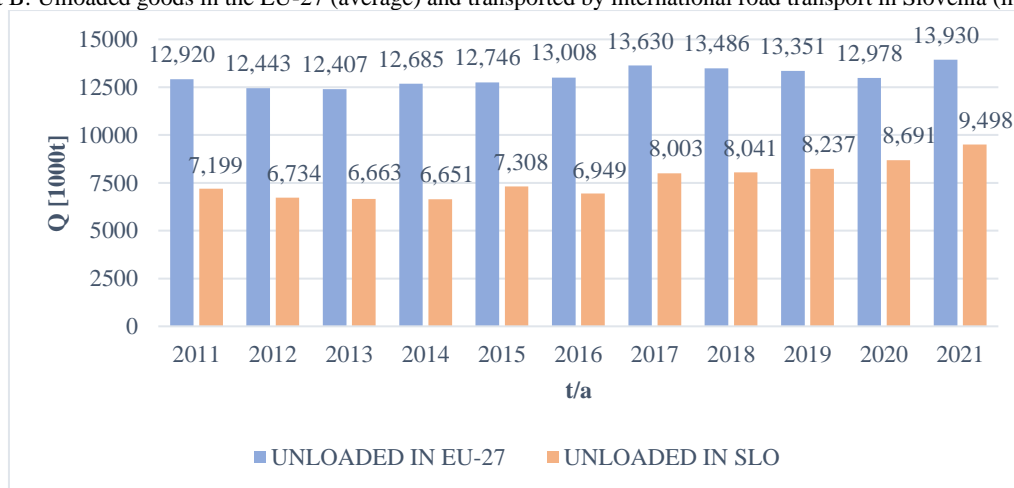
Source: Eurostat, 2022

Chart A: Loaded goods in EU-27 (average) and transported by international road transport in Slovenia (in 1000t)



Source: Eurostat, 2022

Chart B: Unloaded goods in the EU-27 (average) and transported by international road transport in Slovenia (in 1000t)



Source: Eurostat, 2022

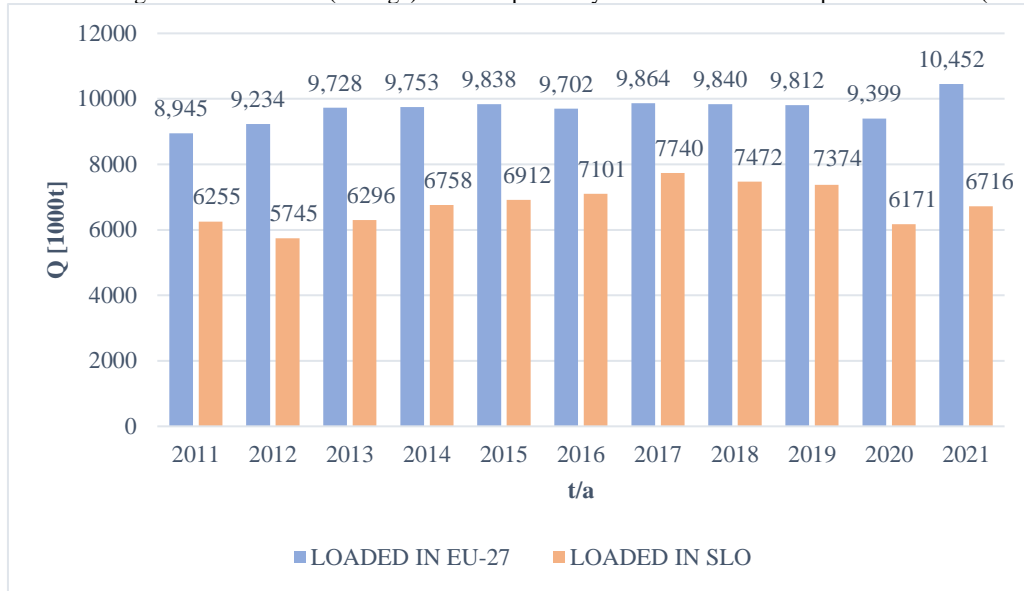
Table B: Loaded and unloaded goods in EU-27 and Slovenia transported by international rail transport (in 1000t)

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Loaded in EU-27 [1000t]*	8945	9233,81	9728,48	9753,14	9838	9702,17	9864,39	9839,87	9811,61	9398,78	10452,09
Unloaded in EU27 [1000t]*	13398,24	12797,76	13235,24	13602,81	13438,48	13140,96	13226,96	13753,87	13366,35	12006,35	12807,09
Loaded in SLO [1000t]	6255	5745	6296	6758	6912	7101	7740	7472	7374	6171	6716
Unloaded in SLO [1000t]	3936	3542	4210	4312	4279	4473	4604	5031	4838	4500	4354

* average

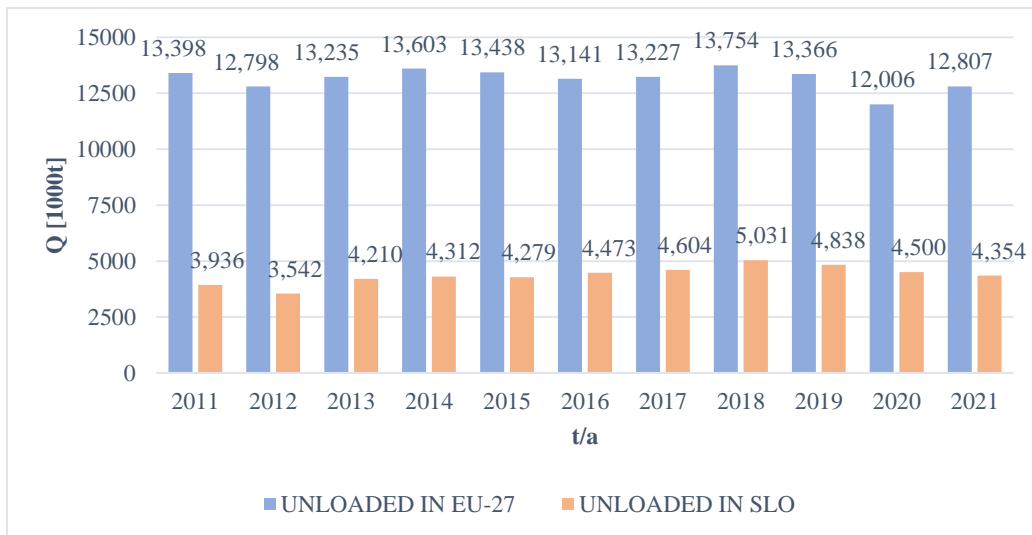
Source: Eurostat, 2022

Chart C: Loaded goods in the EU-27 (average) and transported by international rail transport in Slovenia (in 1000t)



Source: Eurostat, 2022

Chart D: Unloaded goods in the EU-27 (average) and transported by international rail transport in Slovenia (in 1000t)



Source: Eurostat, 2022

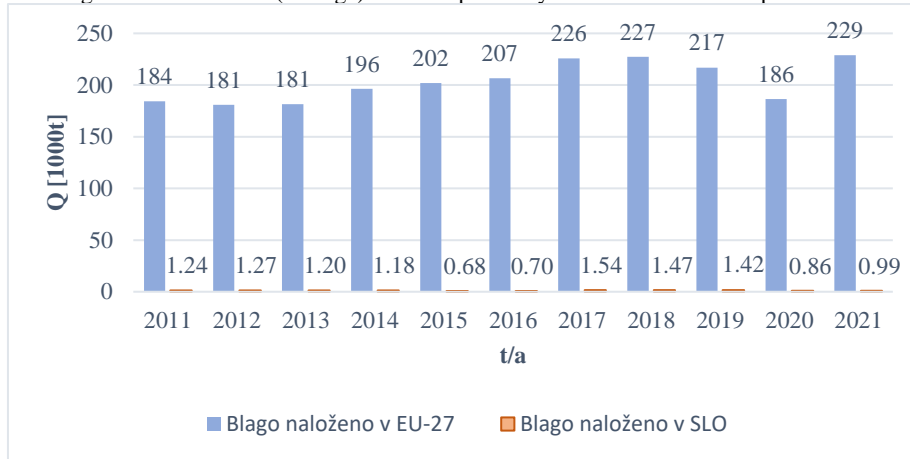
Table C: Loaded and unloaded goods in the EU-27 (average) and transported by international air transport in Slovenia (in 1000t)

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Loaded goods in EU-27 [1000t]*	184,37	180,87	181,50	196,21	201,91	206,67	225,63	227,31	216,86	186,40	228,85
Uploaded goods in EU-27 [1000t]*	164,39	158,65	161,50	176,07	172,77	180,67	197,21	207,21	201,05	186,32	227,77
Loaded goods in SLO [1000t]	1,24	1,27	1,20	1,18	0,68	0,70	1,54	1,47	1,42	0,86	0,99
Uploaded goods in SLO [1000t]	0,54	0,35	0,31	0,32	0,39	0,18	0,61	0,83	0,73	0,94	0,46

* average

Source: Eurostat, 2022

Chart E: Loaded goods in the EU-27 (average) and transported by international air transport to Slovenia (in 1000t)



Source: Eurostat, 2022

Chart F: Unloaded goods in the EU-27 (average) and transported by international air transport to Slovenia (in 1000t)



Source: Eurostat, 2022

Table D: Total goods handled in ports in EU-27 (average) and Slovenia (in 1000t)

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Total EU-27*	148480,27	147354,68	146177,50	149418,59	151988,86	153486,50	158003,41	162933,55	163057,14	151165,73	157389,05
Total SLO	16198	16907	17184	18012	19931	21171	22311	23127	22114	18314	20060

* average

Source: Eurostat, 2022

