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Dutch international trade in goods during the pandemic: a macro and microanalysis

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Abstract

The spring of 2020 marks a difficult moment for the Dutch trade in goods as exporters were hit hard by the Covid-19 global crisis. Although the overall level of exports and imports suffered, the extent to which individual firms were affected varied greatly. This chapter starts by reviewing the patterns of the Dutch trade in goods during the pandemic from a macro perspective. It then moves to examine the heterogeneity in the response of Dutch goods traders to the crisis: which firms were most affected by the Covid-19 crisis? Did more productive or large firms experience less of a drop in exports or imports? Did the group of firms receiving government aid suffer less during the global crisis. In answering these questions, not only the phase of the pandemic is taken into account, but also the differences between firms in size class, industry and whether or not it was a recipient of government support.

1. Introduction

The Dutch international trade in goods was hit hard by the Covid-19 global crisis, mainly in the first half of 2020. Exports of goods shrank by over 17 percent in the second quarter of 2020 compared to the same quarter in 2019. This was in line with the global decline in the international trade in goods, as the total value of the world trade in goods declined by over 21 percent in the second quarter of 2020 compared to the same period in 2019 (WTO, 2021). Consequently the total Dutch imports and exports of goods in 2020 turned out lower than expected based on the trend in international trade over the past decade.

The huge contraction in Dutch trade in 2020 (of -7.8 percent for export and -6.3 for import) is second largest after the decline in the international trade in goods during the financial crisis of 2008-2009 when the value of imports and exports fell by 18.4 and 16.5 percent respectively. Although the large drop in imports and exports in 2020 came as a response to the pandemic that gripped the world in 2020, there were more factors at play back then. Tensions between oil-producing countries such as Russia and Saudi Arabia led to the price of oil dropping to record lows in the first quarter of 2020, while demand for energy carriers - influenced by the Corona crisis - fell sharply (Schwarz, 2021).

During 2020, global production and international trade picked up, but the sharp rebound in demand, imbalances in recovery and disrupted production chains led to shortages - and price

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increases - of raw materials, components and materials such as steel, wood and packaging materials. The global shortage of chips existed before the Covid-19 global crisis but did become increasingly acute for many automotive and consumer electronics manufacturers during 2020 (Bown, 2021). In addition, the imbalance in container transport pushed transport costs to great heights (ING, 2021; Rabobank, 2021). Furthermore, 2020 was also the year of the formal Brexit and the beginning of the transition period to a trade agreement between the UK and the EU. In short, 2020 was an eventful year.

The shock caused by the corona crisis had a fairly asymmetric nature both across the different months of the year 2020 and across various industries. The GDP loss in the Netherlands and other countries was considerably larger during the first wave than during the second wave of the Coronavirus (Elbourne & Overvest, 2021). This was partly due to the ferocity with which the corona crisis struck and the greater extent of uncertainty during the first wave. The extent to which firms were affected was also partly related to the nature of the product or service they provided. Some Dutch industries such as the hospitality industry, the events industry, or contact professions had to close down (for a shorter or longer period of time, in whole or in part) during the first wave. Supermarkets and other essential stores, however, experienced unprecedented sales growth. Because people stayed (and worked) at home so much, the scale of online shopping grew rapidly and significantly more money was spent on groceries, home furnishings or consumer electronics. Thus the lockdown measures caused a shift in consumers' spending patterns. The Dutch retail sector - including online stores - therefore had record growth in terms of sales in 2020 (CBS, 2021a).

To minimize the impact of the crisis on firms, emergency support measures were taken by the Dutch government. These measures targeted those mostly impacted by the lockdown. During the second wave, at least in the Netherlands, it took a longer time before the implemented measures had an effect on the number of corona cases. Also, unlike the first wave, there was no longer an unexpected exogenous shock. By the second wave it was clear which lockdown measures the market should expect. In addition, the production of many goods worldwide continued unabated. China, had to deal with a virus upsurge to a much lesser degree, so Chinese exports continued to grow at full speed, sometimes even falling short of the demand. While during the first wave entire sections of the production chain were fully halted in order to prevent further cases, in the second wave this was hardly ever the case. The incidents in meat processing industry are one of the few exceptions.

The resilience of firms also plays a role in how they have weathered the corona crisis (so far). Some firms are better equipped to cope with the negative effects of a crisis such as the Covid-19 crisis than others. Some firms had a better starting position than their competitors, for example by being a priori more productive or having more investment in digital facilities. In addition, the population of international goods traders is by nature very dynamic. Extensive entry and exit is an established characteristic of that group of firms, even outside times of crisis. Van den Berg et al. (2019) show about 16 percent of firms of traders do so continuously, i.e. every year between 2010 and 2018. This means that over 80 percent of traders were occasional exporters. Despite being a minority, perennial exporters account for about 80 percent of the value of export and 90 percent of the value of import in the period under consideration. Occasional exporters are clearly a distinct group not only in terms of trade value or patterns of entry and exit, but also in terms of firm characteristics such as productivity and capital intensity (Boutorat et al., 2019). Together they form an intermediate group, in terms of productivity, between perennial exporters and non-exporters.

In this chapter, we examine firms' response to and performance during the Covid-19 crisis, taking into account the asymmetric nature of the crisis and different aspects of firm heterogeneity. In doing so, we tackle the following research questions:

- Does the severity of the Covid-19 crisis in countries that are trading partners to the Netherlands play a role in determining the course of Dutch goods exports to, and imports from, those countries during the pandemic?
- What is the relationship between the number of Covid-19 vaccinations in partner countries and the course of the Dutch trade in goods with that country?
- How did the international trade of different groups of firms develop during the Covid-19 crisis?
- What role does a firm's industry or independent SME status play in explaining the development of its goods trade during the pandemic?
- How did the impact of the pandemic on the international trade in goods differ with government support?
- Do differences in resilience (measured by firm productivity and/or digitalization before the crisis) and the dynamics in the population of traders help explain the differences in response to the pandemic?

Section 2 provides a literature review of the impact of the Covid-19 crisis on firm performance. Section 3 then examines the impact of the pandemic on international trade in goods from a macroeconomic perspective. Section 4 presents an overview of international trade activities of the different types of firms. The response of different groups of Dutch traders to the Covid-19 crisis is then examined in Section 5. Section 6 concludes and summarizes. Data and methodology are highlighted in Section 7.

2. The pandemic and international trade in goods: a literature review

The scholarly literature on the effects of the pandemic on international trade is expanding rapidly, both in terms of studies on the macro and on the firm level. Whereas the 2008 credit crisis and subsequent recessions mainly reduced demand for products, the corona crisis has a triple effect: supply disruptions (supply problems, inventory shortages, labor shortages), shifts in global demand (changes in consumer spending patterns and a decline in investment), and "contagion effects" (mutual contagion, or a so-called waterfall effect) in the global value chain (Baldwin & Tomiura, 2020; Friedt, 2021). The first supply shock in international chains originated in China in the first months of 2020. China - the "factory of the world" - is central to many global value chains. Therefore, the production interruptions caused by the corona outbreak in this country had a huge impact on Chinese exports of goods to other countries and therefore on many sectors worldwide (Baldwin & Tomiura, 2020; Meier & Pinto, 2020).

However, when a shock such as the pandemic occurs, its effects extend beyond those directly affected traders to everyone connected to those traders through global production chains. Meier and Pinto (2020) show that sectors with a higher dependency on intermediate inputs from China were faced with higher import prices of these inputs and had to charge higher prices for its output than sectors with a relatively low dependency on Chinese inputs. Producers in global value chains that depended on semi-finished or intermediate inputs from countries with a Covid-19 outbreak and related lockdown measures were forced to find new trading partners or use alternative products.

China, in turn, was also affected by the disruption of global value chains of intermediate products essential to Chinese exports (Friedt, 2021). Benguria (2021) shows that the global decline in exports occurred mainly among producers of intermediate inputs and capital goods, and to a lesser extent among producers of consumer goods. It also shows that the decline in exports was mainly caused by a shock along the intensive margin, i.e. traders lowering their export value yet staying in the market. In addition to manufacturing, the service sector was also negatively affected by the Corona pandemic and the associated lockdown measures (Çakmakli et al., 2020; Baldwin & Tomiura, 2020; WTO, 2021). Maliszewska et al. (2020) show that the decline in the production of services has been greater than that in the production of goods in the aftermath of the pandemic. Research shows the import of services to be essential for the export of goods. The disruption of trade in services due to the pandemic might therefore have indirect consequences for the global trade in goods (Bohn et al., 2021).

3. Macro estimation of the consequences of the pandemic for the international trade in goods

Dutch international trade in goods in the year 2020 was substantially lower than one would expect based on long-standing trends. In this section, we use an econometric model to estimate the relationship between the severity of the pandemic and the development of both Dutch imports and exports from a macro perspective. We do this first for total Dutch trade in goods, with all countries in the world, and then specifically for the ten most important trading partners (namely, Germany, China, Belgium, the United States, the United Kingdom, France, Russia, Italy and depending on the year analyzed also Spain, Poland, Sweden, Norway, Taiwan and Ireland). Using first differences we correct for unobserved country characteristics that may affect Dutch goods trade as well as for observed variables (e.g. GDP per capita, seasonal effects), thus providing a more reliable estimate of the correlation between the Covid-19 crisis and international trade in case of the Netherlands.

3.1 Regression results export and import value in the macromodel

	Log export value – All partners	Log import value – All partners	Log export value – Top-10 partners	Log import value – Top-10 partners
Covid-19 cases (log)	–0,007	–0,034	–0,019**	–0,012***
Covid-19 deaths (log)	–0,007*	–0,027	–0,017***	–0,013***
Stringency index	–0,005***	–0,006**	–0,004***	–0,003***
Vaccinations in t-1 (cumulative) (log)	0,009***	0,007	0,007***	0,009***
N	7 200	7 200	574	574

***p<0,01;**p<0,05;*p<0,1

To quantify the ferocity and severity of the pandemic in a given partner country, we use several indicators, namely: the number of Corona cases per month per 100 thousand inhabitants in the trading country, the number of Corona-related deaths per month per 100 thousand inhabitants in the partner country and the number of Covid-19 vaccinations (cumulative per 100 thousand inhabitants) in the trading partner. We also use a so-called stringency index, which measures the stringency of the lockdown in the respective partner country. These Corona indicators come from official government data in each country, see Section 7 on data and methodology. Since the

correlation between the Covid-19 crisis and international trade cannot be linear, we use a logarithmic regression that provides a better fit of the data. Table 3.1 presents the results of the estimations.

Coronavirus cases, vaccinations and the value of trade

The analysis shows that the coefficients of the four types of Corona measures are mainly statistically significant in explaining the development of international trade with the top 10 trading partners; countries with which the Netherlands trades a lot. A 1 percent increase in the number of cases per 100 thousand inhabitants in the top 10 trading partners is associated with an estimated 0.012 percent decline in Dutch imports from and an estimated 0.019 percent decline in exports to these countries. This means that if the number of Coronavirus cases doubles in a given month compared to the month before, Dutch exports to our top 10 trading partners fall by an average of 1.9 percent. A similar relationship can be seen between the development of exports to, and imports from, the top 10 trading partners and corona-related deaths in the respective countries. This suggests that a possible underreporting of the number of Coronavirus cases - which was especially prevalent in some countries at the beginning of the pandemic - does not distort the regression results. The analysis also shows that moving from a situation without restrictions (as in 2019) to the highest level of stringency (in 2020) is associated with over a half percent drop in export and import value.

The number of vaccinations in the partners with which the Netherlands trades, which only became relevant at a later stage of the crisis, is associated with an increase in export value. A 1 percent increase in the number of vaccinations per 100 thousand inhabitants is associated with an estimated 0.009 percent increase in export value, while the coefficient for import value in the analysis with all trading partners is not statistically significant. The coefficient of vaccinations in the top 10 trading partners is positive and statistically significant for both export and import.

Different traded product unevenly hit by the pandemic

The correlation between the severity of the Corona crisis and the development of Dutch international trade in goods with the top-10 trading partners seems to vary by product category (according to the Standard International Trade Classification, SITC1). The negative correlation between Corona cases and Corona-related deaths on the one hand and export value on the other hand is mainly fueled by the decline in trade in manufactured goods (especially travel goods and handbags, clothing and shoes), machinery and transport equipment (especially vehicles for road transport and other transport equipment) and raw materials. For further details on the analysis by product category, see tables A.9.1 and A.9.2 in the appendix.

The negative correlation between measures of the severity of the Corona crisis on the one hand and the import value from the top 10 trading partners was mainly caused by the decline in the import of mineral fuels (mainly crude oil, petroleum products and natural gas), beverages and tobacco and manufactured goods. In the case of mineral fuels trade, there was not only a decline in volume, but also a decline in price, which significantly reduced the total value of trade in these products especially in 2020.

4. Firm heterogeneity and trade in the pandemic: a descriptive analysis

The previous section shows that Dutch goods traders trading with partners with high levels of Coronavirus cases/deaths and/or strict lockdown measures suffered more in terms of trade decline. In particular, when the pandemic intensified in neighboring countries or key trading partners, this was associated with lower import and export values. Higher vaccination coverage in a trading partner was associated with higher import or export value. Here, the type of Corona measure (cases, deaths, vaccination) and the stringency index (measuring the stringency of lockdown measures) acted as a proxy for the stage of the crisis.

This section begins with an overview of the literature on firm heterogeneity and the pandemic. It then proceeds to examine that role, both descriptively and econometrically, in the case of the Netherlands. Different types of firms seem to respond differently to a crisis like the Corona pandemic. Smaller firms for example seem to be hit relatively harder by the Corona crisis than larger firms (Fernández-Cereo et al., 2021). The negative impact of the Corona crisis was also greater on less productive firms (Bloom et al., 2020; Fernández-Cereo et al., 2021). In addition, the impact of the pandemic varies across industries (Bloom et al., 2020; De Lyon & Dhingra, 2021). This can be explained by a number of reasons, all related to the nature of the industry and the goods and services it produces, for example through the possibility of remote production and the dependence of the production process on personal interactions (Bloom et al., 2020). Thus, in some industries, no negative effects on economic activity and trade have been observed. Some sectors, like IT and medical equipment, even benefited from the pandemic (Gu et al., 2020; Liu et al., 2021; WHO, 2020).

The degree of digitization and the presence of appropriate channels for online sales are important factors of resilience during the Corona crisis. Import shrinkage (from China) was significantly smaller for products that could be created with (a lot of) teleworking (Liu et al., 2021). For example, experience with teleworking before the crisis ensured that business operations could continue relatively uninterrupted during the crisis, so the negative effects of the Corona crisis on sales of these firms were relatively lower (Bai et al., 2021; Kawaguchi et al., 2021). Moreover, such effect of digitalization seems to be larger for smaller firms (Doerr et al., 2021). On the other hand, the digital infrastructure that a firm already has in terms of e-commerce can also make a firm better able to cope with the shock of the pandemic. Existing digital infrastructure (e.g., an online store), and knowledge and experience using it, has allowed firms to achieve higher productivity and higher sales (Doerr et al., 2021; Pierri & Timmer, 2020; Andrews et al., 2021).

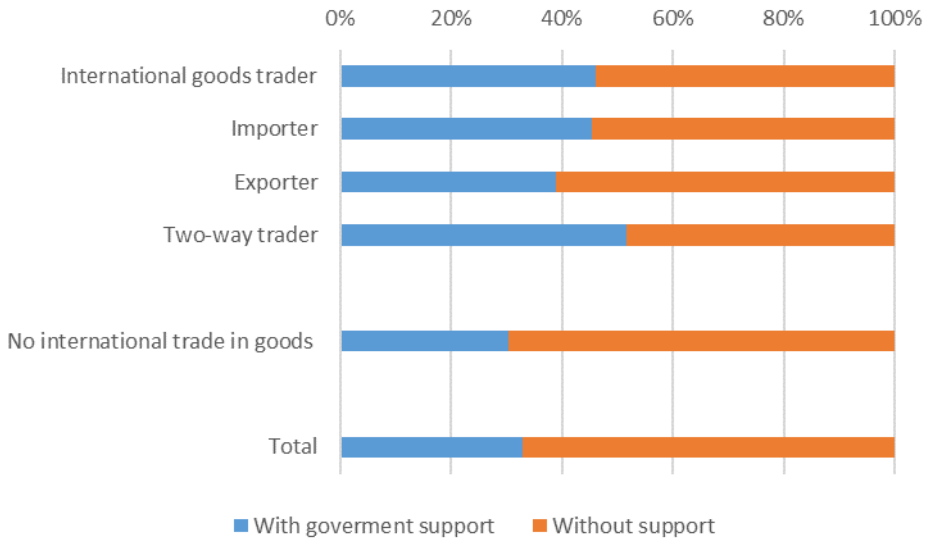
Government support and firm heterogeneity in times of the pandemic

The social and economic disruption caused by the Corona crisis affected our health situation, our social life, our work and our economic situation. The crisis also led to exceptional financial measures, which had an impact on the resilience of the business sector. Research shows that support measures in several countries have helped firms to address liquidity constraints and to maintain both business activity and employment (Cirera et al., 2021; Pál & Lalinsky, 2021). The Dutch government has created several measures to support firms. Until August 2021, nearly 634 thousand firms, nearly one third of all Dutch firms, received support from at least one of these government programs. It was mainly at the beginning of the crisis that firms resorted to government support. During the summer months of 2020, firms were already making significantly less use of available support programs. In the summer of 2020, lockdown measures were being relaxed, thereby reducing the need for government support. As the summer came to and an end,

the pandemic intensified again and the Netherlands went into a new lockdown in December 2020. This led to an increase in the number of firms claiming support in late 2020 and early 2021 (CBS, 2021b; CBS, 2021c).

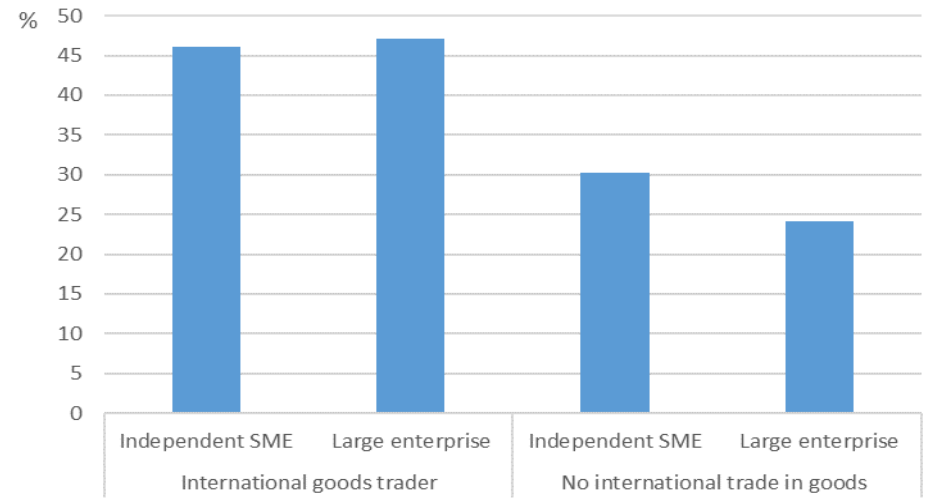
Between March 2020 and the end of August 2021, 46 percent of international goods traders used at least one corona-related government support measure. For the group of firms that had no international goods trade in the period in question, the percentage of support applicants is 30, see Figure 4.1. In absolute terms, we see more applicants for support measures in the group 'no international goods trader', but in relative terms the proportion of applicants is larger in the group 'international goods trader'. Also within the group of international traders we see variations in use of government support programs. For example, two-way traders applied for support relatively more often than firms that only import or export during the crisis period. These are firms that import and export goods. Just over half of these firms received support. For importers of goods, this percentage was 45 percent.

4.1 Use of government aid during the pandemic, until August 2021



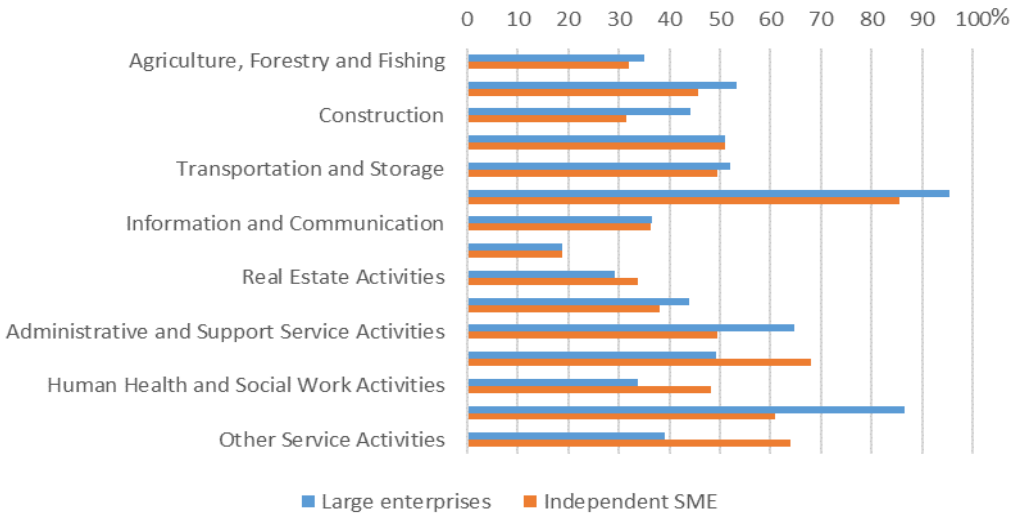
In absolute terms, it is mainly the independent SMEs that applied for government aid. Of all the firms that used government aid during the corona crisis, 99 percent were independent SMEs. This is not surprising, as almost 99 percent of all Dutch firms is an independent SME (CBS, 2021d). For international traders, this ratio was different. About 46 percent of all internationally active independent SMEs applied for government support at some point during the Corona crisis. Similarly 47 percent of the large enterprises applied for support, see Figure 4.2. For importers, exporters and two-way traders within the group of independent SMEs, the percentages of firms using government support were 45, 39 and 52 percent, respectively. Among the independent SMEs that are not internationally active, about 30 percent applied for support. Among large enterprises that are not internationally active only 24 percent of the firms applied for government support.

4.2 Proportion of firms with aid, by trade status and firm size, till August 2021



Around 35 percent of the goods traders that received government support are active in the wholesale and retail trade sector. In addition, internationally trading firms in the business services sector, in manufacturing and in other services (such as hairdressers and beauty salons) made relatively greater use of government aid packages during the Corona crisis. Nearly 85 percent of all internationally trading independent SMEs active in the hospitality sector applied for government support at some point during the Corona crisis, see Figure 4.3. For the internationally active large enterprises in the hospitality sector, the figure was as high as 96 percent. The hospitality industry had the highest percentage of firms using support measures in the period April 2020 to March 2021 (CBS, 2021e). This is not very surprising as this sector was particularly hit hard by the different lockdown measures.

4.3 Proportion of traders with aid during the pandemic, by size class and industry, till August 2021



Large enterprises hit harder by Corona crisis and SME's recovered faster

Figure 4.4 shows the development of the export value of independent SMEs relative to large enterprises since the beginning of 2020. The export value of independent SMEs fell sharply in April 2020, but not as sharply as the export value of large enterprises. In May, the export value of

large companies was similar to the value in April. In the meantime, independent SMEs were already recovering a bit.

4.4 Evolution export value of independent SMEs and large enterprises

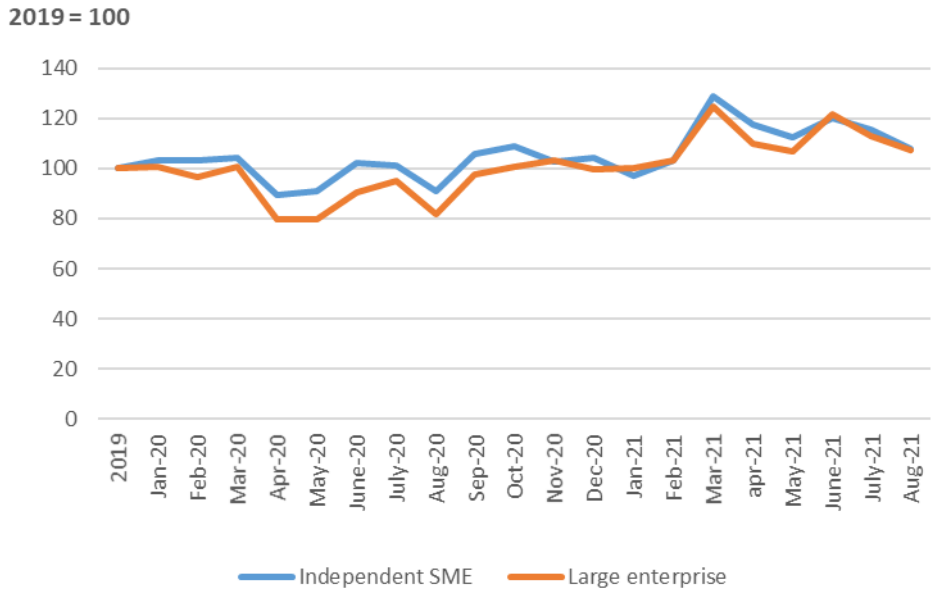


Figure 4.5 shows the year-on-year development per month, which shows that in April, large enterprises lost about 18 percent in export value compared to the same month one year earlier, while independent SMEs had about 15 percent less exports. In May, the export of large enterprises fell even further with a year-on-year contraction of more than 22 percent, independent SMEs again lost 15 percent. Following the low point in the spring, exports of both independent SMEs and large enterprises started growing again - albeit with ups and downs. However, large enterprises had to come a much longer way than independent SMEs to return to their pre-crisis position. Moreover, in some months of 2020 (namely, June, September, November and December), independent SMEs were already showing growth compared to the same month a year earlier, while for each month, the exports of large enterprises were lower than a year earlier.

4.5 Monthly year-on-year change in export value, 2019 – 2020

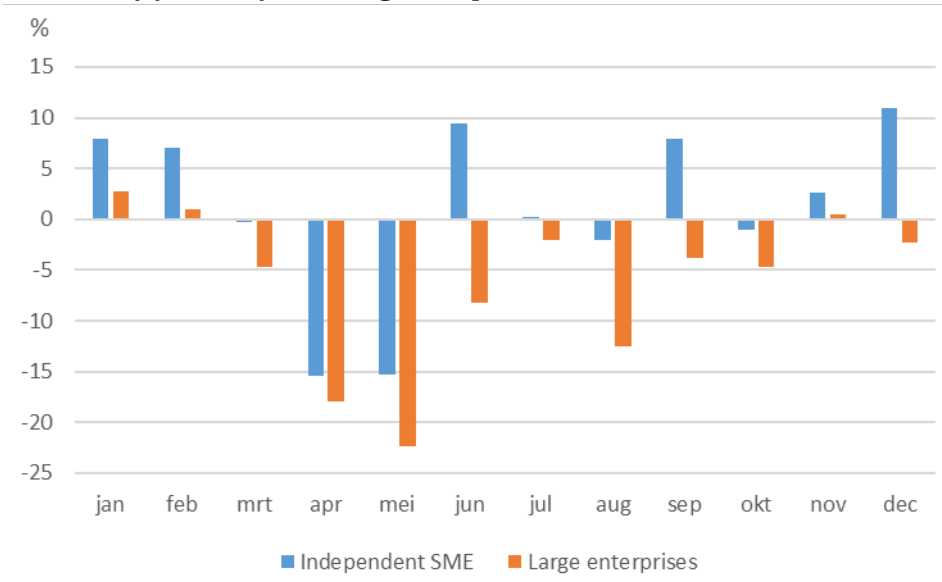
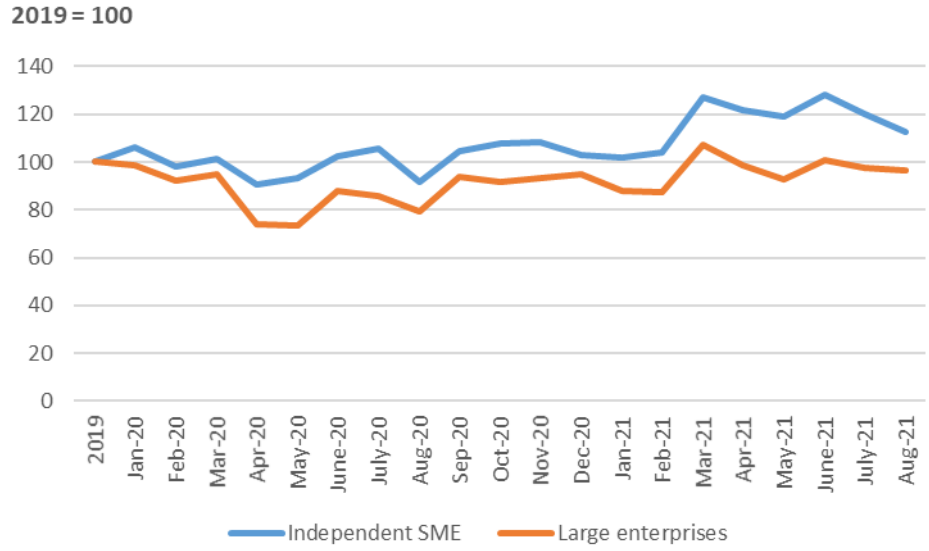


Figure 4.6 shows the development of the import value of independent SMEs compared to large enterprises since the beginning of 2020. Again, the effects of the Corona crisis can be clearly seen in the imports of large enterprise while the import value of independent SMEs did not fall as much in the spring of 2020. Both independent SMEs and large enterprises saw their imports grow again in the summer, albeit with an erratic pattern. However, since 2021, imports of independent SMEs have been growing more strongly than those of large enterprises.

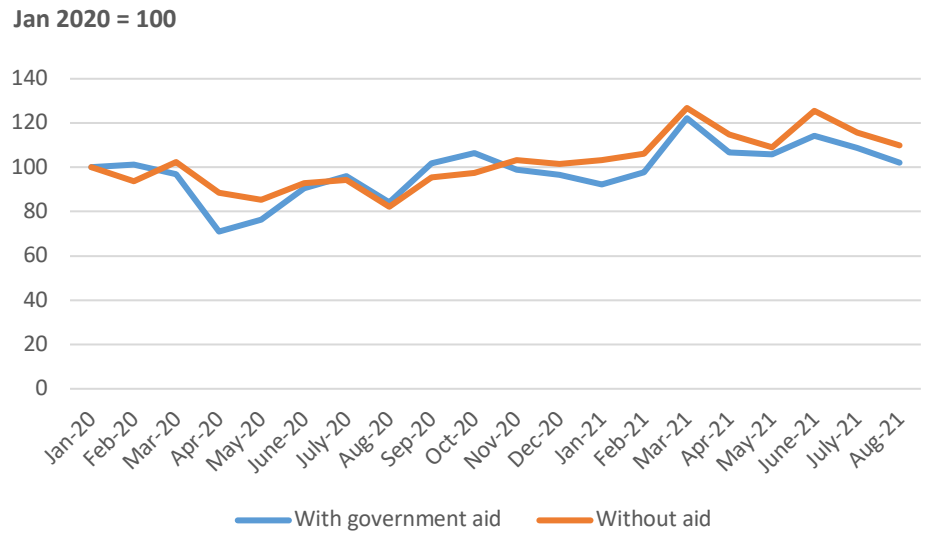
4.6 Evolution import value of independent SMEs and large enterprises



Firms receiving government aid had the biggest decline in trade during crisis

Exporting firms that received government emergency support at some point in 2020 or 2021 experienced - as a group - a less favorable export performance than firms that did not receive such support, see Figure 4.7. In particular, the decline in export value in April and May 2020 was much larger for the firms that applied for support. The combined export value of these firms in April 2020 was about 29 percent lower than January 2020; for the firms that did not apply for support during the corona crisis, it was about 15 percent lower. For international traders, the reduction in exports of these firms may be part of an overall reduction in turnover, which is one of the conditions to qualify for support. In addition, the recovery of exports around the turn of the year was also less successful for the group of companies that received support. As of March 2021, exports of firms with emergency support have also exceeded their pre-crisis levels. For imports, a similar pattern can be seen, with a large dip at the start of the Corona crisis for the firms that applied for support during the crisis, but a fairly even development of the trade value since the summer of 2020.

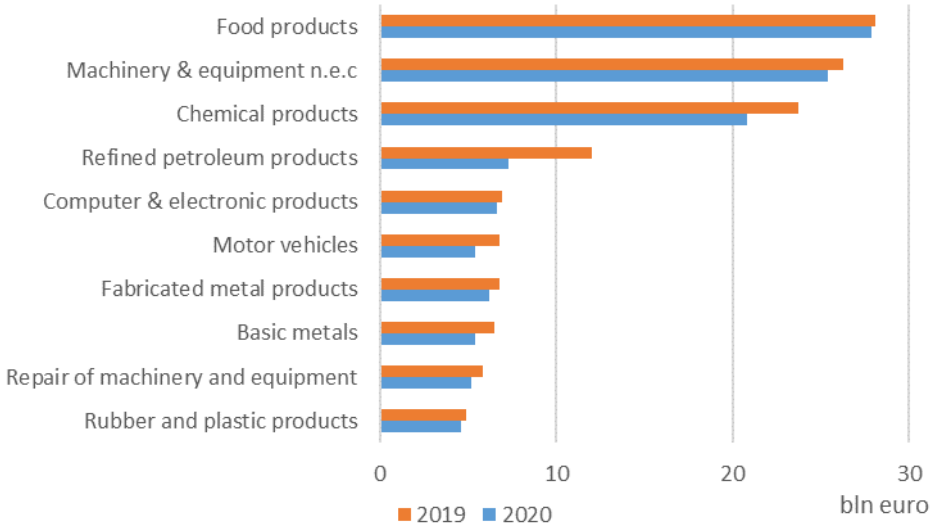
4.7 Evolution export value of firms with and without government aid



Asymmetry in the consequences of the pandemic across industries

The largest exporting industry, wholesale traders, saw its exports drop slightly (-1.4 billion euros) in 2020 compared to 2019. That's a decrease of about one percent. The manufacturing sector on the other hand experienced a stronger export contraction of 12.8 billion in 2020: a decline of more than 8 percent. Of the ten largest industries in within the manufacturing sector, none experienced an increase in its export value in 2020 compared to a year earlier, see Figure 4.8. In particular, the petroleum processing industry saw a considerable decline in export value in 2020. Export of the food and electrical and electronic engineering industries barely suffered from the Corona pandemic and experienced virtually no export contraction in 2020.

4.8 Export value of top 10 manufacturing sectors



On the import side, the largest decline in 2020 was also in the petroleum processing industry. The food industry and the other machinery and equipment sector barely experienced any decline in import value.

5. Firm heterogeneity and trade in the pandemic: an econometric analysis

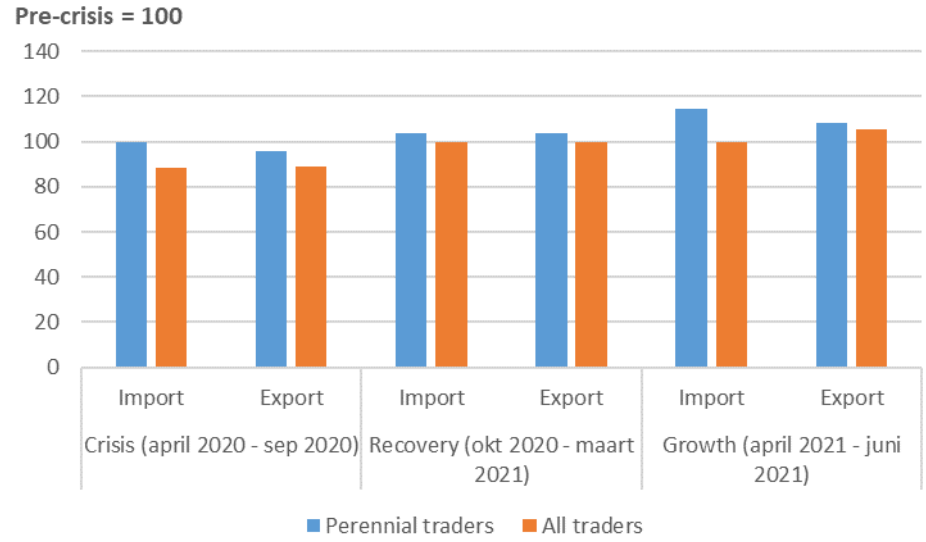
The descriptive statistics in the previous section showed how the import and export value of different groups of firms evolved during the Corona crisis. This section examines whether these conclusions still hold when simultaneously controlling for differences in firm characteristics: independent SMEs/large firms, industry, use of ICT, use of Corona government aid packages and labor productivity. The econometric analysis distinguishes four different phases of the Corona crisis, namely the pre-crisis (October 2019 - March 2020), deep crisis (April 2020 - September 2020), recovery (October 2020 - March 2021), and growth phase (April 2021 - June 2021). The crisis period is characterized by a sharp decline in merchandise trade. The recovery phase covers the months when exports and imports returned to, but did not exceed, their pre-crisis levels. Starting March 2021 recovery was followed by a period of growth in which export and import exceeded their pre-crisis levels.

In the econometric analysis at hand we look at Dutch imports and exports of goods on a quarterly basis during the aforementioned four phases of the Corona crisis. Our population consists of all firms that had imports or exports at any time between the fourth quarter of 2019 and the second quarter of 2021. This includes firms that temporarily or permanently (within the period under study) stopped exporting and/or importing and those who traded occasionally. Since perennial traders account for most of the value of trade, we repeat our analysis for the subpopulation of perennial traders in the period under consideration. Hence, our subpopulation of interest consists of traders who had imports or exports in all seven quarters under consideration.

Figure 5.1 shows how the imports and exports of the two populations of interest evolved during the Corona crisis, relative to their pre-crisis respective levels (shown in the figure with the horizontal line at 100 percent). Looking at all traders in the years 2019-2021, and thus including export/import stoppers, the deep crisis phase (April-September 2020) brought on a decline of over 10 percent in export value and 11 percent on the import side compared to the pre-crisis period. Perennial exporters on the other hand experienced an average export decline of only 4 percent relative to the pre-crisis period. Importers who reported imports in each quarter between October 2019 and June 2021 did not experience any significant import decline during the deep crisis months, as Figure 5.1 shows. This calculation takes into account all possible differences between firms and between years.

We do not see a significant difference in trade values between the recovery phase and the pre-crisis phase when we look at the entire population of importers or exporters. Such a significant difference does exist between the two phases when we look at the subpopulation of perennial traders. In the recovery period, continuous traders experienced a growth of 3.5 percent in exports and almost 4 percent in imports. In the growth phase, this group's trade continued to grow by 8 percent for exports and 14 percent for imports compared to pre-crisis levels. When we consider the entire population of exporters perennial and occasional, we still see a significant increase of over 5 percent in exports during the growth period compared to the pre-crisis period. Again, differences between firms and years have been taken into account. Table 8.3 in the appendix summarizes the econometric results on the relationship between quarterly trade in goods and the different phases of the pandemic.

5.1 Evolution of import and export during the pandemic relative to the pre-crisis period



Several aspects of firm heterogeneity play a role when it comes to a firm's foreign trade behavior. For example, exporters are more productive than firms that do not export (Genee & Fortanier, 2010; Vancauteren, 2015; Vancauteren & Walthouwer, 2016). Importers are also on average more productive than firms that focus entirely on the domestic market. Larger firms in terms of employment, which in turn tend to be more productive than smaller firms, also trade more on average. Furthermore, foreign-owned firms are more likely to operate internationally as exporters and/or importers than domestic firms (Bernard et al., 1995; 1999; 2004; 2007; Wagner, 2007). We see these stylized facts not only between firms that are internationally active and those who are not, but also within the group of international traders. For example, there appear to be significant productivity differences between occasional and continuous exporters. Firms that manage to export consecutively for a number of years are, on average, larger, more productive, and more profitable than firms that only export occasionally (Boutorat et al., 2019).

These links between firm characteristics and the value of imports and exports are also confirmed by our analysis during all four phases of the corona crisis and for both populations (see table 8.4 in the appendix). In addition to accounting for firm heterogeneity, our model also accounts for differences between industries and between years and for the type of products traded. Firms that mostly focus on intermediate products export and import more than firms that trade mostly in capital goods. On the other hand, trade in consumer goods in general seems to be associated with a lower export value. See section 7 for more details on the specification of the model.

The 'positive' face of the crisis seen by traders of consumer goods

Based on the population of all Dutch exporters, exporters of capital goods experienced a nearly 9 percent decline in their export value during the deep crisis period. In contrast, perennial exporters of capital goods experienced a 3 percent decline in their export value compared to their pre-crisis export value. Furthermore, importers of these goods experienced an even larger decline during the crisis. Both imports and exports of capital goods returned to pre-crisis levels during the recovery and growth period, sometimes even growing by 6 percent, particularly in the case of exports.

Dutch trade in intermediate goods seems to have followed similar patterns to capital goods during and after the deep crisis period. Traders in consumer goods, on the other hand, seem to have had a considerably different experience of the pandemic compared to traders of capital and

intermediate goods, especially during the deep crisis phase. Exporters of consumer goods, in both populations, hardly experienced any decline in their exports during the deep crisis phase. In fact, perennial exporters experienced a 7 percent growth in the export value of consumer goods during the deep crisis. This is while exporting consumer goods is generally associated with a lower export value than intermediate and capital goods. On the import side, a similar trend can be seen for this type of goods. For example, all Dutch importers of consumer goods experienced a growth of over 2 percent during the deep crisis, while the group of continuous importers experienced growth of over 9 percent during the same period. Table 8.5 in the appendix summarizes the econometric results on the relationship between the type of traded goods and trade performance during the pandemic.

Superior performance of SMEs mainly due to new entrants

Independent SMEs tend to export and import less than large enterprises. For example, the export and import value of all independent SMEs was more than 80 percent lower than the exports of large enterprises in the pre-crisis period. In other words, before the Corona crisis, large enterprises exported and imported more than four times as much as independent SMEs. Within the group of continuous exporters and importers, this difference between large enterprises and independent SMEs is obviously smaller.

5.2 Size class and trade performance during the pandemic: regression output

	All exporters	Perennial exporters	All importers	Perennial importers
	%			
Independent SME (dummy)	–83,0***	–45,7***	–87,3***	–71,2***
Crisis (April 2020 – Sep 2020) X SME	10,1***	–1,1	16,4***	–4,0***
Recovery (Oct 2020 – Mar 2021) X SME	–0,3	–5,5***	10,6***	0,07
Growth (April 2021 – June 2021) X SME	2,4	–0,1***	20,8***	–0,03*

***p<0,01;**p<0,05;*p<0,1

The descriptive analysis in Section 4 shows that SMEs outperformed large enterprises in terms of exports as well as imports during the deep crisis phase. In the case of imports, independent SMEs even performed slightly better than large enterprises in the recovery and growth periods (see tables 5.2 above and 8.6 in the appendix). A possible explanation for this could be that small firms tend to have fewer suppliers than large ones which may shield them from the largest, direct shocks (OECD, 2020). Compared to large enterprises, independent SMEs do more 'in-house' and are less intertwined in international value chains. As a result, independent SMEs are more focused on the local market for both their supply and demand of goods and services and less focused on direct sales to foreign markets (Statistics Denmark & OECD, 2017; Chong et al., 2019). Furthermore, SMEs may be more likely to operate in regional production chains, in this case European chains, which may shield them from the direct effects of shocks in Asia (OECD, 2020).

However, the finding that independent SMEs show more growth of imports and exports than large enterprises during the deep crisis period appears to be the case only when we look at the entire population of importers and exporters, including occasional traders, new entrants and stoppers. When we look only at firms that exported and/or imported continuously during the period under study, independent SMEs actually do worse than large enterprises in terms of trade value during the deep crisis period.

The above results seem to indicate that growth within the independent SME may have occurred along the extensive margin during the Corona crisis. Indeed, independent SMEs that trade occasionally seem to show a very different (better) picture than continuous traders in terms of the development of their imports and exports during the different phases of the Corona crisis. One hypothesis as to why this might be the case is that the government aid packages may have saved some firms from liquidation or bankruptcy or even allowed them to trade internationally. The better performance of independent SMEs as a whole group-including occasional traders, new entrants, and stoppers-may also be related to an increase in new, small traders such as webshops (CBS, 2020). Based on our analysis with the current preliminary data, we cannot yet draw any final conclusions about the differences between the course of the Corona crisis for independent SME compared to large enterprises.

An unclear role of productivity in trade performance during the pandemic

The role of productivity as a determining factor in how firms respond to the various phases of the Corona crisis appears to be ambiguous (see table 8.7 in the appendix). For example, productivity seems to play a role primarily in the trade performance of the group of continuous exporters and importers. Within this group of continuous traders, we see that more productive firms were hit slightly less hard during the deep crisis period than less productive exporters and importers. The more productive firms suffered a slightly smaller export decline of 7 percent during the deep crisis phase. This is consistent with the literature showing more productive firms to be more resilient. However, during the growth phase in 2021, higher productivity within the continuous traders group did not play a significant role in the recovery of imports and exports. A possible explanation for the (unexpected) absence of this relationship may be related to the lack of current data on firm productivity. For this study, productivity data up to and including 2019, or one year before the corona crisis, were used. The above findings regarding productivity should therefore be interpreted with some caution, as productivity is a dynamic characteristic of firms and could itself have changed during or after the crisis. A number of findings in the literature confirm this hypothesis (Bloom et al., 2021; di Mauro & Syverson, 2020). The role of firm productivity is thus a question for further research.

Evidence on government aid and trade performance remains mixed

In order to map the relationship between support measures and trade behavior during the Covid-19 crisis and afterwards, we focus on the period between April 2020 and June 2021. Looking at all Dutch exporters and importers, traders who received support performed significantly worse during the deep crisis period than exporters and importers who did not receive support. For example, the export value (import value) of the group that did apply for support was more than 22 percent (28 percent) lower than that of the group that did not need support. In the recovery and growth period, aid recipients showed similar growth rates in export and import value compared to firms that did not apply for aid. Whether the use of available support measures was the reason that these firms' trade was able to grow more strongly during the recovery and growth period cannot be concluded from the current analysis.

Government aid is particularly significant when we consider the population of all importers and exporters, including occasional traders. Looking only at continuous exporters, we see no difference between firms with and without support during the deep crisis period. On the import side, we see that firms that received support did in fact do better during the Corona crisis than firms that did not use the support. For example, the import value of perennial importers who received government aid during the crisis was more than 5 percent higher than that of continuous importers who did not use any support measures. A possible explanation for this finding may lie in the fact that the use of support measures varies widely across industries. In particular, traders

in the manufacturing and wholesale trade sectors make relatively extensive use of support packages.

If we restrict the our model to the manufacturing and wholesale trade sectors, together accounting for over three quarters of Dutch export in 2020, we no longer see a difference between firms with and without support among continuous traders. However, differences between the two groups are reaffirmed when we look at all exporters and importers in these two industries during the period April 2020-June 2021. There we see that firms that did not apply for support had higher import and export values than the group that did receive government support. Hence, evidence on the correlation between government aid and trade performance during the crisis remains mixed. Dissecting this relationship might therefore be a question for further research, for example, as soon as more information becomes available about firm productivity during the crisis. Tables 8.8 and 8.9 in the appendix summarize the econometric results on the relationship between government aid and trade performance during the pandemic.

6. Summary and conclusion

The Corona crisis has affected the economy in the Netherlands and also worldwide on several fronts. International trade in goods experienced a sharp decline in 2020. The Dutch import and export value decreased by 7.8 and 6.3 percent respectively. This paper attempted to look at the firms behind the imports and exports, and how their different characteristics correlated with the differences in courses of international trade during the Corona crisis. A macro model was used to examine how the Dutch international trade in goods developed during the Covid-19 crisis. In that context, several measures of the severity of the crisis were considered, namely the number of Coronavirus cases, the number of Corona-related deaths, a lockdown stringency index, and the number of Covid-19 vaccinations in partner countries. As expected, increasing numbers of cases and death as well as increasing stringency of the lockdown in a given partner country correlated negatively with the value of trade with that country. The number of vaccinations on the other hand are associated with a higher level of trade. The changes in international trade due to the Covid-19 crisis are more pronounced for Dutch trade with its top 10 trading partners, than for the total of trade with all partners.

Next, the relationship between the pandemic and international goods trade was examined at the individual firm level, while controlling for a variety of firm characteristics. This analysis allowed us to examine how different types of firms were affected by the pandemic. To this end, micro-level econometric analysis were conducted, taking into account the different phases of the corona crisis (pre-crisis, deep crisis, recovery and growth) for two different populations of firms: all firms with goods trade, and those that traded continuously throughout the period under consideration.

The descriptive analysis showed that almost half (46 percent) of Dutch firms that import and/or export used at least one government support measure. Firms enjoying government support had a larger decline in their imports and exports in 2020 than those that did not apply for support. After the onset of the corona crisis in the Netherlands (with the second quarter of 2020 as the lowest point), the development of international trade of these two groups of firms was similar. The econometric models confirm this: the export value of the group that did apply for support was more than 22 percent lower during the lowest point of the crisis than the export value of the group that did not receive any government support. The import value was even 28 percent lower. In the recovery and growth periods, aid recipients showed similar growth rates to firms that did not apply for aid both in export and in import. However, based on the current data and analysis, it is

not possible to conclude whether the support measures caused these firms to have similar recovery and growth rates as those that did not require support. Moreover, these findings apply to the total population of traders, including occasional traders, entrants and quitters. For continuous traders, the results are not uniform.

As a group, independent SMEs experienced smaller import and export shrinkage than large enterprises. The export value of independent SMEs in April 2020 was about 15 percent lower than in the same month a year earlier. For large enterprises the decline was about 18 percent. In May, the differences widened, with independent SMEs again experiencing a year-on-year decline of 15 percent, and large enterprises experiencing a decline of over 22 percent. Even when controlling for other firm characteristics, independent SMEs seem to do better during the deep crisis than large enterprises. However, this only applies to the entire group of importers and exporters. Amongst the perennial traders, independent SMEs actually suffered more than large enterprises during the crisis phase. Further research into the size of firms, the role of new entrants and occasional traders, and the possible influence of emergency support on survival during the corona crisis is needed to draw conclusions on this matter.

While firms mostly trading in consumer goods usually have a lower export value than firms trading in capital or intermediate goods, the opposite was observed during the pandemic. The trade value of firms specializing in consumer goods barely experienced a contraction during the deep crisis, while traders of intermediate goods and capital goods saw their exports fall sharply. Furthermore, higher productivity seems to be associated with smaller export declines during the deep crisis, but productivity did not seem to play a significant role during the recovery and growth period.

At the time of writing this paper, November 2021, the Corona crisis is far from over. The Dutch economy went through a robust growth period since April 2021, but from September onwards, the number of corona outbreaks at home and abroad increased again. In the fall and early winter of 2021, several European countries were forced to implement stricter lockdown measures again, which have the potential to slow down the European economic recovery. Whether and what impact this new phase of the pandemic will have on international trade in goods and on internationally active firms remains to be seen.

7. Data and methods

The macroanalysis uses monthly microdata from the International Trade in Goods (IHG) statistics for the period 2018-2021 (through June 2021). This data is linked at the month-country level to external data on Coronavirus cases, Corona-related deaths, Covid-19 vaccinations, and lockdown stringency indexes. These external data came from the following sources: (1) the COVID-19 Data Repository by the Center for Systems Science and Engineering at Johns Hopkins University and (2) the COVID-19 Government Responses Tracking Database. The macro analysis was performed for trade with all countries for which Covid-19 information was available; a total of 191 countries. Because the data is non-stationary (a time series with seasonal effects), the use of first-differences was deemed appropriate. This method also corrects for characteristics of firms, countries and time not included as explicit variables in the model.

The macroanalysis is conducted at the month-country level, with the log value of export or import as the outcome variable and the average number of corona cases (or corona-related deaths) per month per 100 thousand inhabitants as the explanatory variable. Vaccinations are measured by a

cumulative figure at the beginning of the month, and converted to logarithms. The stringency index can take values from 0 to 100, where 0 means no lockdown, and 100 is the strictest form of lockdown, based on various lockdown indicators (e.g., school closures, travel restrictions, quarantine, etc.). These were related to our outcome variable in a similar manner.

The econometric model is specified as follows:

$$\Delta y_{it} = \theta \Delta d_{it} + \beta x_{it} + \Delta \varepsilon_{it}$$

Where Δy_{it} is the first difference of the export (or import) value to (from) country *i* in month *t*. Δd_{it} is the first difference of the Corona measure under consideration, x_{it} are control variables (GDP per capita and month fixed effects). Finally, $\Delta \varepsilon_{it}$ is the standard error, clustered at the country level to correct for (possible) serial correlation. This model is applied once for the full set of countries for which Covid-19 information was available and a second time for the top 10 trading partners of the Netherlands.

The microanalysis is conducted at the firm-quarter-product-region level. The population of interest includes all firms with international trade in goods (IHG) at any point in the period 2019-2021. The IHG data was supplemented, based on the business unit identification number, with firm characteristics from other data sources (namely, the Business Demographic Framework, the Structural Business Statistics (SBS), the Tax Administration files, the Business ICT Usage Survey, and the Corona Government Support Measures data) and the information on Corona-related deaths in the Netherlands from RIVM. Firm characteristics that were included in the microanalysis include the industry, firm size in terms of employment, whether or not the firm falls under foreign ownership, whether or not the firm belongs to the independent SMEs, labor productivity (for the years 2018 and 2019), traded products (according to the BEC classification), and whether or not the firm received emergency government aid.

Because the expected correlation between our outcome variable and the different firm characteristics may depend on the phase of the crisis, our analysis distinguishes four key economic phases of the pandemic in the Netherlands based on the course of the Dutch international trade in goods. Theses phases are as follows: pre-crisis (Oct 2019 - March 2020), crisis (April 2020 - Sep 2020), recovery (Oct 2020 - March 2021) and growth (April 2021 - June 2021). As in the macroanalysis, the pre-crisis period is the reference category. In addition, we also use information on the stringency of lockdown measures (stringency index).

Two types of models are used in this analysis. The first model is a log-linear regression with fixed effects in which the focus is on firms that are internationally active in each and every quarter throughout 2019-2021. Thus, this model does not take into account firms that trade occasionally, stop trading in the interim or start trading after October 2019. The second model is a Pseudo Poisson Maximum Likelihood (PPML) model which does take into account firms that start trading after October 2019, stop trading before June 2021 or trade occasionally during the 2019-2021 period. The baseline model looks at the relationship between trade value (exports and imports) on the one hand and the different phases of the corona crisis, taking into account differences between firms, years, traded products and regions of origin and destination (in the form of fixed effects). As an additional robustness check, we look at two alternative versions of the model with Corona-related mortality and the Dutch lockdown index as measures of the corona crisis. The model looks as follows:

$$Y_{ikjpl} = \beta_0 + \beta_{1kj} D_{kj} + \alpha_i + \theta_j + \gamma_p + \delta_l + \varepsilon_{ikjpl}$$

Where Y_{ikjpl} is the log of import/export value of firm *i* in quarter *k* in year *j* of product *p* to region *l*, D_{kj} is the corresponding crisis measure in quarter *k* in year *j*. α_i is the firm fixed effect of firm *i*, θ_j is the year fixed effect of year *j*, γ_p is the product fixed effect of product *p* and δ_l is the region fixed effect of region *l*.

In the basic specification, all unobserved differences between firms that do not change over time are included by means of the fixed effects. Because in this study we also want to identify precisely these differences between firms, for example in terms of their size class or productivity, we also look at an alternative specification without firm fixed effects. To control for unobserved differences between observations, we do use fixed effects at the level of industry, product, region and year. Since we are particularly interested in how the relationship between different firm characteristics and merchandise trade varies across different phases of the corona crisis, we also look at the interaction between the different characteristics on the one hand and the different phases of the pandemic on the other, on firms' import and export values by quarter. The extended specification is as follows:

$$Y_{ikjpl} = \exp\left[\beta_0 + \beta_{1kj} D_{kj} + \beta_2 Z_{ikj} + \beta_3 Z_{ikj} D_{kj} + \beta_4 X_{ikj} + \rho_i + \theta_j + \gamma_p + \delta_l\right] * \varepsilon_{ikjpl}$$

Where Z_{ikj} is a characteristic of firm *i* in quarter *k* and year *j*. X_{ikj} is a vector of all other firm characteristics controlled for in the model. ρ_i is an industry fixed effect.

8. Appendix

8.1 Dutch export value and the pandemic in the top 10 partner countries by product

	Corona cases in partner country (log)	Corona deaths in partner country (log)	Stringency index in partner country (0–100)	Vaccinations in partner country (log)
0 Food and live animals	−0.008***	−0.009	−0.002***	0.005***
1 Beverages and tobacco	0.002	0.001	−0.001	0.003
2 Crude materials, inedible, except fuels	−0.018**	−0.018***	−0.003***	0.014***
3 Mineral fuels, lubricants and related materials	0.013	−0.007	−0.010*	0.021
4 Animal and vegetable oils, fats and waxes	0.010	−0.016*	−0.005***	0.010**
5 Chemicals and related products, n.e.s.	0.007	0.006	−0.001	0.002
6 Manufactured goods classified chiefly by material	−0.011**	−0.011**	−0.003***	0.009***
7 Machinery and transport equipment	−0.015***	−0.020***	−0.005***	0.007***
8 Miscellaneous manufactured articles	−0.027***	−0.028***	−0.006***	0.010***
Number of observations	533	533	533	533

***p<0.01;**p<0.05;*p<0.1

8.2 Dutch import value and the pandemic in the top 10 partner countries by product

	Corona cases in partner country (log)	Corona deaths in partner country (log)	Stringency index in partner country (0–100)	Vaccinations in partner country (log)
0 Food and live animals	0.005	0.004	–0.001	0.002
1 Beverages and tobacco	–0.038**	–0.028**	–0.003**	–0.004
2 Crude materials, inedible, except fuels	0.004	0.006	–0.001	0.01
3 Mineral fuels, lubricants and related materials	–0.058***	–0.037***	–0.008***	0.002
4 Animal and vegetable oils, fats and waxes	0.005	0.005	0.002	–0.019
5 Chemicals and related products, n.e.s.	–0.006	0.001	–0.001	0.006***
6 Manufactured goods classified chiefly by material	0.004	–0.001	–0.001***	0.010***
7 Machinery and transport equipment	–0.002	–0.014***	–0.004***	0.010***
8 Miscellaneous manufactured articles	–0.008	–0.020***	–0.004***	0.016***
Number of observations	501	501	501	501

***p<0.01;**p<0.05;*p<0.1

8.3 Basic specification: quarterly trade and the different phases of the pandemic

	PPML Export (value)	Log-linear Export (log)	PPML Import (value)	Log-linear Import (log)
Corona dummy: pre-crisis as baseline				
Crisis (April 2020 - Sep 2020)	-0.1144***	-0.04088***	-0.1212***	-0.003402
	(0.01790)	(0.006165)	(0.01652)	(0.004542)
Recovery (Oct 2020 - Mar 2021)	0.004494	0.03516***	-0.02328	0.03930***
	(0.02209)	(0.007317)	(0.01725)	(0.005392)
Growth (April 2021 - June 2021)	0.05408*	0.08209***	0.03635	0.1437***
	(0.02773)	(0.009718)	(0.02492)	(0.007398)
N	2123755	646502	3738001	1157115
adj. R-sq		0.440		0.469
Firm Fixed Effects	Yes	Yes	Yes	Yes
Product Fixed Effect	Yes	Yes	Yes	Yes
Region Fixed Effect	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes
Quarter Fixed Effect	No	No	No	No

Standard errors in parentheses - * p<0.10 ** p<0.05 *** p<0.01

8.4 Firm characteristics and trade during the 4 phases of the pandemic

	PPML Exporters (all)	Log-linear Exporters (perennial)	PPML Importers (all)	Log-linear Importers (Perennial)
Corona dummy: pre-crisis as baseline				
Crisis (April 2020 - Sep 2020)	-0.101***	-0.0342***	-0.114***	-0.00127
	(0.0206)	(0.00731)	(0.0183)	(0.00537)
Recovery (Oct 2020 - Mar 2021)	0.0127	0.0308***	-0.0211	0.0276***
	(0.0256)	(0.00904)	(0.0179)	(0.00638)
Growth (April 2021 - June 2021)	0.0515	0.0857***	0.0380	0.131***
	(0.0314)	(0.0118)	(0.0281)	(0.00881)
Size class < 10 employees as baseline				
10 to 50 employees	1.017***	0.531***	1.090***	0.831***
	(0.103)	(0.0236)	(0.113)	(0.0174)
50 to 250 employees	2.214***	1.165***	2.045***	1.352***
	(0.0999)	(0.0365)	(0.0800)	(0.0288)
More than 250 employees	3.623***	1.771***	3.452***	1.971***
	(0.224)	(0.0702)	(0.139)	(0.0582)
Average labour productivity pre-crisis (log)	1.030***	0.442***	0.803***	0.404***
	(0.204)	(0.0188)	(0.147)	(0.0145)
Is foreign owned(Dutch owned as baseline)	0.133	0.273***	0.452***	0.259***
	(0.203)	(0.0357)	(0.151)	(0.0299)
Product sort: Capital goods as baseline				
Intermediate goods	0.530***	0.283***	0.883***	0.547***
	(0.202)	(0.0323)	(0.122)	(0.0223)
Consumption goods	0.275	-0.144***	0.374***	0.161***
	(0.219)	(0.0458)	(0.0946)	(0.0293)
Region of destination: Europe & Central Asia as baseline				
East Asia & Pacific	-1.468***	-1.549***	-0.893***	-1.102***
	(0.381)	(0.0267)	(0.114)	(0.0225)
Latin America & Caribbean	-2.327***	-2.185***	-1.975***	-1.339***
	(0.142)	(0.0327)	(0.135)	(0.0637)
Middle East & North Africa	-2.221***	-1.929***	-2.376***	-2.142***
	(0.105)	(0.0294)	(0.217)	(0.0495)
North America	-1.884***	-1.546***	-1.700***	-2.109***
	(0.143)	(0.0276)	(0.119)	(0.0259)
South Asia	-3.491***	-2.428***	-2.507***	-1.254***
	(0.117)	(0.0464)	(0.153)	(0.0402)
Sub-Saharan Africa	-2.428***	-2.027***	-2.248***	-1.555***
	(0.197)	(0.0384)	(0.210)	(0.0737)
N	1438070	531347	2368864	925287
adj. R-sq		0.168		0.195
Firm Fixed Effects	No	No	No	No
Industry Fixed Effects	Yes	Yes	Yes	Yes
Product & region Fixed Effect	No	No	No	No
Year Fixed Effect	Yes	Yes	Yes	Yes
Quarter Fixed Effect	No	No	No	No

8.5 Product types and trade during the 4 phases of the pandemic

	PPML Exporters (All)	Log-linear Exporters (Perennial)	PPML Importers (All)	Log-linear Importers (Perennial)
Corona dummy: pre-crisis as baseline				
Crisis (April 2020 - Sep 2020)	-0.0930**	-0.0336*	-0.157***	0.00624
	(0.0372)	(0.0177)	(0.0470)	(0.0162)
Recovery (Oct 2020 - Mar 2021)	0.0642*	0.0108	0.0216	-0.00482
	(0.0384)	(0.0194)	(0.0379)	(0.0170)
Growth (April 2021 - June 2021)	0.0104	0.0639***	-0.0501	0.0123
	(0.0402)	(0.0241)	(0.0598)	(0.0208)
Product sort: Capital goods as baseline				
Intermediate goods	0.559***	0.270***	0.882***	0.541***
	(0.194)	(0.0347)	(0.145)	(0.0253)
Consumption goods	0.266	-0.196***	0.315***	0.131***
	(0.209)	(0.0485)	(0.106)	(0.0324)
Interaction Coronadummy X Product sort: pre-crsis X apital goods as baseline				
Crisis X Intermediate goods	-0.0412	0.0260	0.00685	0.0465**
	(0.0420)	(0.0202)	(0.0531)	(0.0191)
Crisis X Consumption goods	0.0803**	0.0985***	0.155***	0.0917***
	(0.0368)	(0.0255)	(0.0554)	(0.0218)
Recovery X Intremediate goods	-0.0626**	0.0223	-0.0680	-0.0452**
	(0.0303)	(0.0211)	(0.0497)	(0.0195)
Recovery X Consumption goods	-0.0653*	0.0323	-0.0154	-0.0237
	(0.0337)	(0.0260)	(0.0400)	(0.0225)
Growth X Intermediate goods	0.0346	-0.0119	0.0931	-0.0112
	(0.0400)	(0.0260)	(0.0856)	(0.0233)
Growth X Consumption goods	0.0384	0.0444	0.0774	0.00961
	(0.0383)	(0.0323)	(0.0593)	(0.0274)
Size class < 10 employees as baseline				
10 to 50 employees	1.098***	0.552***	1.229***	0.848***
	(0.101)	(0.0234)	(0.120)	(0.0173)
50 to 250 employees	2.391***	1.238***	2.344***	1.414***
	(0.0999)	(0.0356)	(0.0780)	(0.0283)
More than 250 employees	3.839***	1.879***	3.841***	2.068***
	(0.146)	(0.0696)	(0.0998)	(0.0566)
Average labour productivity pre-crisis (log)	1.066***	0.454***	0.876***	0.412***
	(0.186)	(0.0190)	(0.144)	(0.0145)
N	1593042	531347	2654837	925287
adj. R-sq		0.166		0.195
Firm Fixed Effects	No	No	No	No
Industry Fixed Effects	Yes	Yes	Yes	Yes
Product Fixed Effect	No	No	No	No
Region Fixed Effect	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes
Quarter Fixed Effect	No	No	No	No

Standard errors in parentheses - * p<0.10 ** p<0.05 *** p<0.01

8.6 The role of size class in trade performance during the pandemic

	PPML Exporters (All)	Log-linear Exporters (Perennial)	PPML Importers (All)	Log-linear Importers (Perennial)
Corona dummy: pre-crisis as baseline				
Crisis (April 2020 - Sep 2020)	-0.127***	-0.0256*	-0.154***	0.0283**
	(0.0244)	(0.0154)	(0.0234)	(0.0139)
Recovery (Oct 2020 - Mar 2021)	0.0148	0.0649***	-0.0458*	0.0234
	(0.0284)	(0.0183)	(0.0247)	(0.0151)
Growth (April 2021 - June 2021)	0.0423	0.167***	-0.0147	0.153***
	(0.0356)	(0.0219)	(0.0400)	(0.0195)
Independent SME dummy	-1.771***	-0.457***	-2.061***	-0.712***
	(0.0901)	(0.0364)	(0.0850)	(0.0299)
Interaction SME X Corona dummy				
Crisis X SME	0.0962***	-0.0111	0.152***	-0.0399***
	(0.0253)	(0.0168)	(0.0294)	(0.0146)
Recovery X SME	-0.00283	-0.0546***	0.101***	0.000653
	(0.0260)	(0.0188)	(0.0342)	(0.0156)
Growth X SME	0.0237	-0.126***	0.189***	-0.0347*
	(0.0385)	(0.0226)	(0.0566)	(0.0199)
Average labour productivity pre-crisis (log)	0.891***	0.439***	0.666***	0.416***
	(0.181)	(0.0202)	(0.119)	(0.0157)
N	1589929	531347	2634832	925287
adj. R-sq		0.138		0.166
Firm Fixed Effects	No	No	No	No
Industry Fixed Effects	Yes	Yes	Yes	Yes
Product Fixed Effect	Yes	Yes	Yes	Yes
Region Fixed Effect	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes
Quarter Fixed Effect	No	No	No	No

Standard errors in parentheses - * p<0.10 ** p<0.05 *** p<0.01

8.7 The role of labour productivity in trade performance during the pandemic

	PPML Exporters (All)	Log-linear reg Exporters (Perennial)	PPML Importers (All)	Log-linear reg Importers (Perennial)
Corona dummy: pre-crisis as baseline				
Crisis (April 2020 - Sep 2020)	0.0609	-0.0894***	0.0491	-0.0335*
	(0.103)	(0.0323)	(0.0809)	(0.0201)
Recovery (Oct 2020 - Mar 2021)	0.0984	0.0592	0.0241	0.0792***
	(0.0917)	(0.0372)	(0.119)	(0.0216)
Growth (April 2021 - June 2021)	0.0979	0.154***	-0.00339	0.171***
	(0.126)	(0.0473)	(0.104)	(0.0289)
Interaction Corona dummy X Labour productivity (log)				
Crisis X productivity	-0.0332	0.0129*	-0.0346**	0.00852*
	(0.0216)	(0.00731)	(0.0168)	(0.00497)
Recovery X productivity	-0.0183	-0.00660	-0.00915	-0.0123**
	(0.0178)	(0.00832)	(0.0236)	(0.00524)
Growth X productivity	-0.0113	-0.0155	0.00724	-0.00978
	(0.0243)	(0.0104)	(0.0203)	(0.00693)
Average labour productivity pre-crisis (log)	0.707***	0.412***	0.599***	0.393***
	(0.0880)	(0.0170)	(0.0668)	(0.0136)
Size class < 10 employees as baseline				
10 to 50 employees	1.057***	0.548***	1.147***	0.840***
	(0.102)	(0.0236)	(0.112)	(0.0174)
50 to 250 employees	2.250***	1.175***	2.143***	1.339***
	(0.126)	(0.0359)	(0.115)	(0.0288)
More than 250 employees	3.517***	1.733***	3.413***	1.922***
	(0.215)	(0.0686)	(0.148)	(0.0565)
Is foreign owned(Dutch owned as baseline)	0.0674	0.247***	0.390**	0.247***
	(0.201)	(0.0351)	(0.153)	(0.0294)
N	1506904	560152	2463667	966779
adj. R-sq		0.164		0.190
Firm Fixed Effects	No	No	No	No
Industry Fixed Effects	Yes	Yes	Yes	Yes
Product Fixed Effect	Yes	Yes	Yes	Yes
Region Fixed Effect	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes
Quarter Fixed Effect	No	No	No	No

Standard errors in parentheses - * p<0.10 ** p<0.05 *** p<0.01

8.8 Government aid packages and trade during the pandemic

	PPML Exporters (All)	Log-linear reg Exporters (Perennial)	PPML Importers (All)	Log-linear reg Importers (Perennial)
Corona dummy: Crisis as baseline				
Recovery (Oct 2020 - Mar 2021)	0.112***	0.0544***	0.0807***	0.0292***
	(0.0258)	(0.0116)	(0.0222)	(0.00767)
Growth (April 2021 - June 2021)	0.162***	0.0927***	0.145***	0.135***
	(0.0291)	(0.0152)	(0.0390)	(0.0111)
Received government aid dummy	-0.252**	-0.00560	-0.331***	0.0497***
	(0.116)	(0.0250)	(0.103)	(0.0169)
Interaction Corona dummy X government aid				
Recovery X Received aid	0.0118	0.0177	0.0375	-0.00248
	(0.0342)	(0.0145)	(0.0336)	(0.00996)
Growth X Received aid	-0.00996	0.0447**	0.0284	-0.00712
	(0.0428)	(0.0182)	(0.0596)	(0.0132)
Size class < 10 employees as baseline				
10 to 50 employees	1.074***	0.541***	1.122***	0.823***
	(0.105)	(0.0245)	(0.107)	(0.0183)
50 to 250 employees	2.254***	1.177***	2.077***	1.362***
	(0.101)	(0.0371)	(0.0815)	(0.0294)
More than 250 employees	3.673***	1.813***	3.451***	1.990***
	(0.221)	(0.0702)	(0.137)	(0.0580)
Average labour productivity pre-crisis (log)	0.978***	0.444***	0.741***	0.402***
	(0.195)	(0.0191)	(0.157)	(0.0145)
Is foreign owned(Dutch owned as baseline)	0.128	0.284***	0.451***	0.270***
	(0.207)	(0.0361)	(0.145)	(0.0304)
N	1040970	379686	1723596	663310
adj. R-sq		0.168		0.190
Firm Fixed Effects	No	No	No	No
Industry Fixed Effects	Yes	Yes	Yes	Yes
Product Fixed Effect	Yes	Yes	Yes	Yes
Region Fixed Effect	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes
Quarter Fixed Effect	No	No	No	No

Standard errors in parentheses - * p<0.10 ** p<0.05 *** p<0.01

8.9 Government aid packages and trade during the pandemic in the manufacuting and wholesale trade sectors

	PPML Exporters (All)	Log-linear reg Exporters (Perennial)	PPML Importers (All)	Log-linear reg Importers (Perennial)
Corona dummy: Crisis as baseline				
Recovery (Oct 2020 - Mar 2021)	0.113***	0.0511***	0.0691***	0.0158*
	(0.0237)	(0.0124)	(0.0191)	(0.00911)
Growth (April 2021 - June 2021)	0.186***	0.0899***	0.141***	0.109***
	(0.0316)	(0.0161)	(0.0406)	(0.0131)
Received government aid dummy	-0.224*	-0.0144	-0.272**	0.00896
	(0.133)	(0.0255)	(0.107)	(0.0177)
Interaction Corona dummy X government aid				
Recovery X Received aid	0.0164	0.00796	0.0740**	-0.00617
	(0.0299)	(0.0151)	(0.0330)	(0.0116)
Growth X Received aid	-0.0271	0.0193	0.0401	-0.00259
	(0.0459)	(0.0189)	(0.0626)	(0.0153)
Size class < 10 employees as baseline				
10 to 50 employees	1.134***	0.585***	1.163***	0.851***
	(0.105)	(0.0255)	(0.104)	(0.0192)
50 to 250 employees	2.373***	1.320***	2.198***	1.490***
	(0.123)	(0.0373)	(0.108)	(0.0313)
More than 250 employees	3.859***	2.090***	3.542***	2.240***
	(0.220)	(0.0746)	(0.145)	(0.0637)
Average labour productivity pre-crisis (log)	0.657***	0.439***	0.591***	0.458***
	(0.0925)	(0.0180)	(0.0751)	(0.0125)
Is foreign owned(Dutch owned as baseline)	-0.0142	0.235***	0.437***	0.256***
	(0.234)	(0.0351)	(0.159)	(0.0304)
N	751148	317319	982752	505859
adj. R-sq		0.168		0.159
Firm Fixed Effects	No	No	No	No
Industry Fixed Effects	Yes	Yes	Yes	Yes
Product Fixed Effect	Yes	Yes	Yes	Yes
Region Fixed Effect	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes
Quarter Fixed Effect	No	No	No	No

Standard errors in parentheses - * p<0.10 ** p<0.05 *** p<0.01