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IMPACT OF COVID-19 ON TUNISIAN IMPORTS

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SUSTAINABLE DEVELOPMENT GOALS
AND EXTERNAL SHOCKS IN THE MENA REGION:

FROM RESILIENCE TO CHANGE IN THE WAKE OF COVID-19

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Impact of COVID-19 on Tunisian imports

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Abstract

The COVID-19 pandemic disrupted the trade flows between countries, revealing the vulnerability related to global value chains (GVCs). This unexpected event sparked a public debate on devising new policies to increase the resilience of value chains. To this end, identifying the factors favoring the exposure to shortages resulting from disruption of supply is a prime concern. This paper assesses the effects of three potential drivers of vulnerability on Tunisia's imports. The three factors subject to our study are country-specific product characteristics. We consider, for each product, (1) the market concentration of Tunisia's partners, (2) the intensity of imports, and (3) the feasibility of the imported good in Tunisia. First, we classify the products imported by Tunisia into risky and less risky clusters based on the three factors of vulnerability. Second, we use a first level difference estimation to evaluate if the change in the imports of risky products explain the change in total imports at the country-month and at the country-quarter level between 2019 and 2020.

Keywords: COVID-19, vulnerability, global value chains, Tunisia.

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1. Introduction

The COVID-19 pandemic has significantly disrupted supply chains, affecting most economies. According to the World Trade organization (WTO), the volume of world merchandise trade declined by 9.2% in 2020[4]. Supply chains disruptions might have uneven effects on countries. The WTO forecasts a larger decline of 14% in 2020 imports for Africa, Middle East and Commonwealth of Independent States (CIS), including associate and former member States compared to a drop of 8.4% in imports for North America. Its consequences could be larger for developing and emerging countries participating in Global Value Chains (GVC), such as Tunisia.

For instance, a recent United Nations Conference on Trade and Development Report (2020) shows that Tunisia is among the top twenty countries most impacted by Chinese supply disruption. The analysis is based on an assessment of each country's and industry's integration with the Chinese economy using the Grubel-Lloyd Index (GLI) of intra-industry trade. The report underlines that a reduction of two percent of Chinese exports of intermediate products in the electrical machinery sector as an example will cost the Tunisian economy 27 million of US dollars. Similarly, Friedt and Zhang (2020) study the overall impact of COVID-19 on Chinese exports and differentiate between the domestic supply shock, the international demand shock and the effects of global value chain (GVC) contagion. They show that Tunisia is among top exposed countries to Chinese supply disruption together with South American countries, the Democratic Republic of Congo, France and Poland, Zambia and several countries neighboring China (i.e. India, Pakistan, Thailand, Laos, and Vietnam, among others). These findings are supported by Baghdadi (2018)'s assertion that Tunisia's participation in GVCs is highly concentrated at the geographic and sector levels making the Tunisian economy vulnerable to external shocks.

In this study, we aim to identify the sources of vulnerability in Tunisia's supply chains by unveiling which imported products – and sectors – are likely to be most disrupted, thus the riskiest. To this end, we assess first the riskiness of imported products based on three criteria (1) the geographical concentration of suppliers to ensure if the country can easily substitute the sources of its imports, (2) intensity of imports to verify if the product can be easily substituted with another – high intensity means high demand for substitutes which cannot be satisfied in

[4]https://www.wto.org/english/news_e/pres20_e/pr862_e.htm#:~:text=The%20WTO%20now%20forecasts%20a,and%20government%20responses%20to%20it.

the short run, (3) the feasibility of the product to check if it can be produced locally. The choice of these measures is based on a simple question: how do we replace a product that is no more imported? Three options are available. Either we import it from other suppliers, substitute it with a similar product, or produce it. Second, we create two groups of products risky and not risky based on these three criteria and using a k-means clustering approach. Then, we use a first level difference estimation to evaluate if the change in the imports of risky products explain the change in total imports at the country-month and at the country-quarter level between 2019 and 2020

Our approach is similar to methodologies used in the literature. Korniyenko et al. (2017) identify risky products based on three products' characteristics, namely, the presence of central players, the tendency to cluster, and international substitutability. Bonneau and Nakaa (2020) pin down "vulnerable" goods for France through the analysis of extra-European imports of around 5,000 categories of products taking into account first the concentration of imports of each product and second the international substitutability of the product, i.e. the existence of other alternatives for obtaining inputs from other countries. Todo, Nakajima and Matous (2015) and Huang (2019) show that diversification of partners results in higher resilience. The reliance on a small number of suppliers exposes a country to the risk of policy changes. A recent example is the export restrictions that were imposed by many countries on essential goods to address the domestic shortages that followed the sudden rise in demand in response to COVID-19 pandemic.

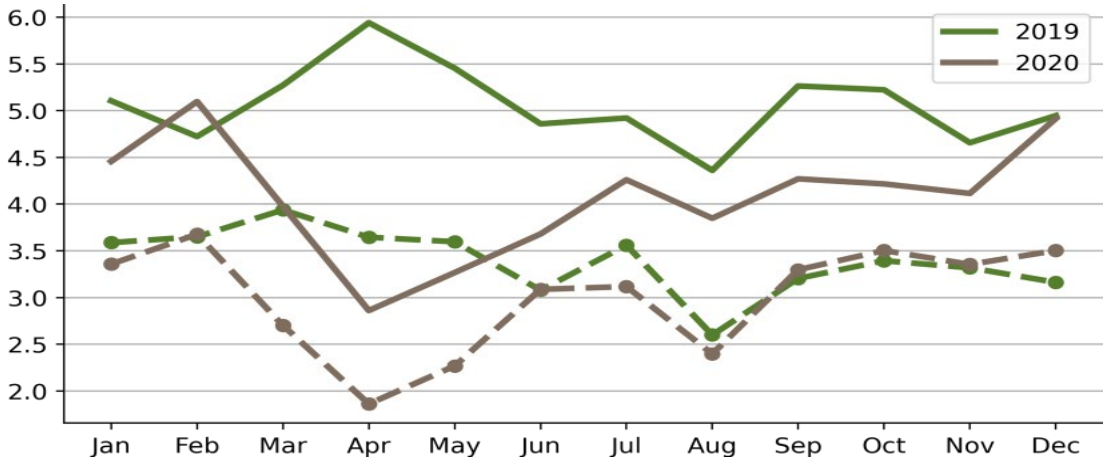
One novelty of our work is the use of 'feasibility' as a measure of product substitutability in the short to medium term. That is, we assess the level of substitutability of goods relying on local production rather than importing similar goods. Feasibility, is only based on the factors of production available in the country and do not take into account tariffs, production costs, or exchange rates. One advantage of considering substitutability from this perspective is its relevance in the case of input specificity of firms. Barrot and Sauvagnat (2016) show that input specificity is a key driver of the propagation of firm-level shocks.

The paper is organized as follows. Section 2 provides the background of our research. It describes the development of Tunisia's trade post-pandemic with a focus on imports. Section 3 outlines our methodology and provides details of the vulnerability measures and econometric specification. Section 4 includes our analysis and final results. Conclusions are drawn in section 5.

2. Research background

The unexpected surge of COVID-19 has caused an unprecedented level of disruption in global trade flows affecting all countries, but with different degrees. Overall, Tunisia's trade has experienced a sharp decline in 2020 compared to 2019; exports were less affected than imports. Imports fell by 11.8 billion TND, that is, a 19.4% change. On the other hand, exports fell by 4.6 billion TND, a decrease by 11.3%. The fall in both trade flows started in February 2020 and registered the sharpest negative picks in April (Figure 1).

Figure 1 Development of Tunisia's trade (billion TND)



Continuous lines: imports; Dashed lines: exports

Tunisia's imports experienced a significant drop in 2020 in all sectors except the agricultural one. The sector 'Agriculture, meat and dairy, seafood' shows a 13.6% increase in imports. Agricultural imports amounted to 4.1 billion TND in 2019 and reached 4.7 billion TND in 2020. Figure 2 shows the change in import values by sector[5]. Going further into details, we find that the agricultural sector imports recorded a single drop of 21% in the second quarter of 2020 compared to 2019. However, their value increased by 13.6%, 54.8%, 15.5% in the first, third, and last quarters respectively.

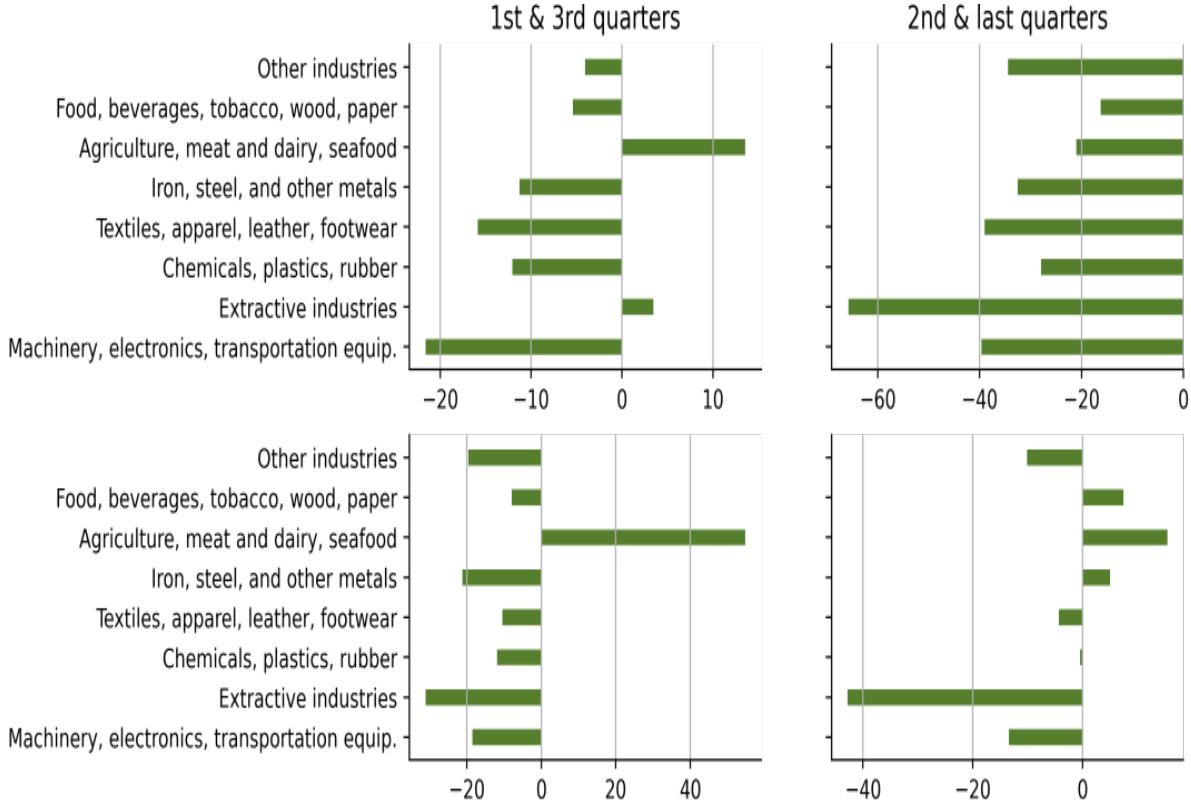
Sectors that participate in upstream GVCs, namely, "Machines, electronics, transport equipment", "textiles, clothing, leather, footwear", and "chemical industries" (Baghdadi, 2018) were heavily impacted in terms of their supplies since the first quarter of 2020. As an example, the "machinery, electronics and transport equipment" sector suffered a reduction of 21.6% in

[5] To determine the difference in imports (%) we calculate the difference in import value between 2020-2019, and divide it by the import value of 2019.

the first quarter of 2020 compared to the first quarter of 2019. Then, a reduction of 39.6% for the second quarter of 2020 compared to 2019. This difference was reduced to 18.5% and 13.4% for the third and fourth quarters, respectively, showing that this sector was relatively able to secure its sources of supply starting from the second quarter. But it remains largely vulnerable to the shock.

The machinery, electronics and transport equipment sector is dependent on the growth of the automobile sector and other means of transport, a sector whose demand has been severely hit globally. It is noteworthy that all sectors have experienced their largest fall in imports in the second quarter of 2020.

Figure 2 Change in Tunisia's imports 2019-2020 (%)



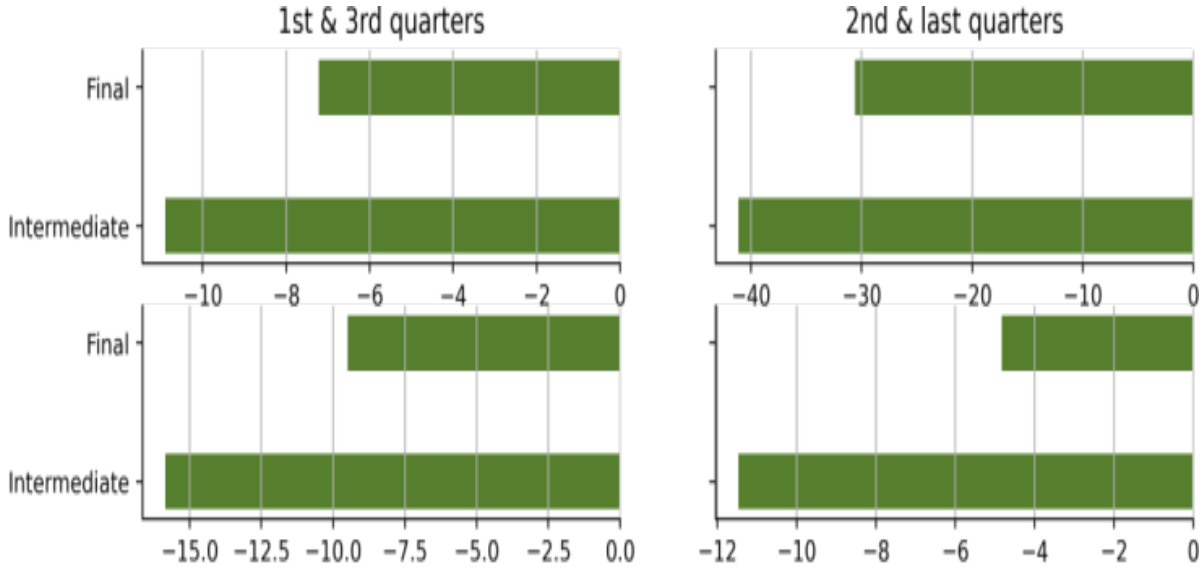
The textiles sector follows the same trend as "machinery, electronics, transport equipment". Nevertheless, this sector shows a certain resilience as it was able to return in the fourth quarter to import levels that are only 4.3% lower than 2019. Chemicals, plastics, rubber sector follows a similar trend to textiles, clothing, leather and footwear sector.

Extractive industries recorded the largest fall in imports (35.9%), followed by the sector 'machinery, electronics, transport equipment' with a 23.5% decrease. Extractive industries also present in downstream GVCs (Baghdadi, 2018) were strongly impacted since the second

quarter with a significant reduction of 65.7%. The sector's imports fell by 31% and 42.8% in the third and fourth quarters of 2020, respectively. This is an evidence of the fragility of the sector and its inability to cope with the shock.

Results from the perspective of products' end use show that, overall, imports of intermediate and final goods fell by 20.3% and 13.3% respectively. Imports of intermediates went from 52.4 billion TND in 2019 to 41.7 billion TND in 2020. Goods imported for final consumption fell from 8.3 billion TND to 7.2 billion TND. Imports of both intermediate and final goods experienced a decline in all quarters (Figure 3).

Figure 3 Change in Tunisia's imports by end use (%)



The market shares of Tunisia's top partners have varied between 2019 and 2020. We note a 13% increase in imports from China in 2020. Unlike the case with its other top partners, Tunisia does not have a reciprocal relationship with China. In 2019, 9.8% of Tunisia's imports came from China, while only 0.3% of its exports went to it. China is ranked 140 in Tunisia's export partners (out of 168). Imports from Algeria experienced a sharp decrease (25%) while exports decreased by 19.5%.

Despite the variations, the rankings of the top 5 partners remain unchanged for the two years. A small exception is noticed for Algeria that ranked sixth in 2020, overtaken by Turkey. However, the difference in the market shares of the two countries is insignificant, as 5.22% and 5.20% of Tunisia's imports came from Turkey and Algeria respectively, in 2020.

3. Methodology and data

Our framework is built on three parts. First, we compute the three determinants of vulnerability. Second, we apply a K-means clustering based on these measures to classify products into risky and less risky groups. Finally, we use a first difference model to study the growth of imports in 2020 compared to 2019 based on the results of clustering.

We use international bilateral trade data from CEPII BACI database for the years 2013 to 2017. Our analysis is based on 4,778 HS-6 product categories, revision of 2007 – the goods imported by Tunisia in all the considered periods. Furthermore, we distinguish between final and intermediary products using Broad Economic Categories (BEC) classification which groups goods based on their primary end use.

3.1. Drivers of vulnerability

In the following, we describe each of the vulnerability measures in detail: (1) concentration of partners, (2) intensity of imports, and (3) feasibility of products.

1. Partners' diversity indicates whether Tunisia's imports depend on a limited number of suppliers. It is the degree of diversity of the sources of imports. We use the market concentration measure Herfindahl-Hirschman Index (HHI) for this purpose. HHI is defined by equation (1):

$$(1)\quad \mathrm{HHI_p} = s_1^2 + s_2^2 + s_3^2 + \cdots + s_n^2$$

HHI is the concentration index of product p; s_i is the partner country's market share; and n is the number of partner countries exporting product p to Tunisia. For each product, we determine the sum of squares of market shares corresponding to each supplier. The index lies between 0 and 1. A value of 1 indicates the highest concentration, thus, the lowest diversification of partners. Imports which are dominated by a limited number of countries are the most vulnerable.

2. The intensity of Tunisia's imports is measured using the revealed comparative advantage for imports (import-RCA). Import-RCA compares a product's share in a country's imports to its share in world imports. It indicates whether Tunisia imports goods in high quantity relative to its size, compared to imports of other countries. A value greater than 1 indicates that the product is intensively imported. However, we use this measure to identify the degree of intensity and not as a filter. Products that are imported intensively are more vulnerable to supply shocks.

$$(2)\ \mathrm{RCA}_{cp} = \frac{X_{cp}}{\sum_p X_{cp}} \Big/ \frac{\sum_c X_{cp}}{\sum_{c,p} X_{cp}}$$

X_{cp} is the import value of country c in product p.

3. Feasibility is an indicator based on the "product space" concept developed by Hausmann and Klinger (2006, 2007) and Hidalgo et al. (2007). Product space is a network that connects goods according to their "proximity". Proximity is a measure that derives from the following idea: if two goods share the same factors of production, they will tend to be produced by the same country. Mathematically, it is the probability that two products are co-exported. A high probability indicates that the two goods share many similarities. Therefore, a country producing one of them is likely to have the productive capabilities necessary to make the other. Feasibility allows us to assess the level of substitutability of products in the short-to-medium term. Substitutability is often identified as a criterion of vulnerability in the literature, although different methods are used to measure it. The higher the feasibility score, the lower the vulnerability of the product.[6]

3.2. Clustering analysis

We conduct a k-means clustering analysis in order to construct two groups of products based on the three indicators described previously[7]. To reach this goal, we determine the three potential drivers of vulnerability for each product, each year apart (from 2013 to 2017). Then, for each product-indicator, we consider the median of all years. Products are classified into two clusters; one for vulnerable products, and the other for less vulnerable ones.

K-means clustering technique identifies centroids around which the clusters are built, based on the products' characteristics. Then, it assigns each product (observation) to one group by minimizing the distance between one centroid and the observation and maximizing the distance between the observation and the other centroids.

3.3. Econometric specification

[6] We use feasibility scores determined by the study made by Amal Medini and Leila Baghdadi.
UN Comtrade data was used to compute feasibility (averages for the period 2013 to 2017).
https://ecdpm.org/great-insights/african-continental-free-trade-area-agreement-impact/unlocking-tunisias-unexploited-export-potential/

[7] In clustering analysis, we use the inverse of the feasibility scores.

In this section we describe the methodology used to test whether the three vulnerability indicators successfully explain the variations in imports that took place during the spread of COVID-19. Our final objective is to conclude whether the identified clusters of products had, each, a specific behavior following the trade disruptions caused by the pandemic. We use monthly bilateral data of Tunisia's trade for the years 2019 and 2020, provided by the Central Bank of Tunisia.

We set a panel regression model to test the robustness of our results. We evaluate the impact of import vulnerability as we define it on the import growth of Tunisia in 2020. We run a first level difference estimation model for the years 2019 and 2020, at the country-month level and at the quarter country-month level:

$$(3)\quad \mathrm{IMP_{it}} - \mathrm{IMP_{it-1}} = \beta_1(RIPC_{it} - \mathrm{RIPC_{it-1}}) + \beta_2(AGR_{it} - \mathrm{AGR_{it-1}}) + \beta_3(\mathrm{MED_{COVID19}}_{it} - \mathrm{MED_{COVID19}}_{it-1}) + \beta_4(RI_t - \mathrm{RI_{t-1}})$$

IMP_{it} is the value imports of Tunisia from partner country i in period t. $RIPC_{it}$is the value of total imports of products we define as risky in period t from supplier country i. AGR and $\mathrm{MED}_{COVID19}$ are excluded from RIPC. AGR_{it} is the value of imports belonging to the agricultural sector supplied by country i in period t. $MED_{COVID19_{it}}$ is the value of imports of medical products required to fight CIVID-19 supplied by country i in period t. RI_t is the total value of risky imports.

4. Results

4.1. Variations in Tunisia's imports 2019-2020: descriptive statistics

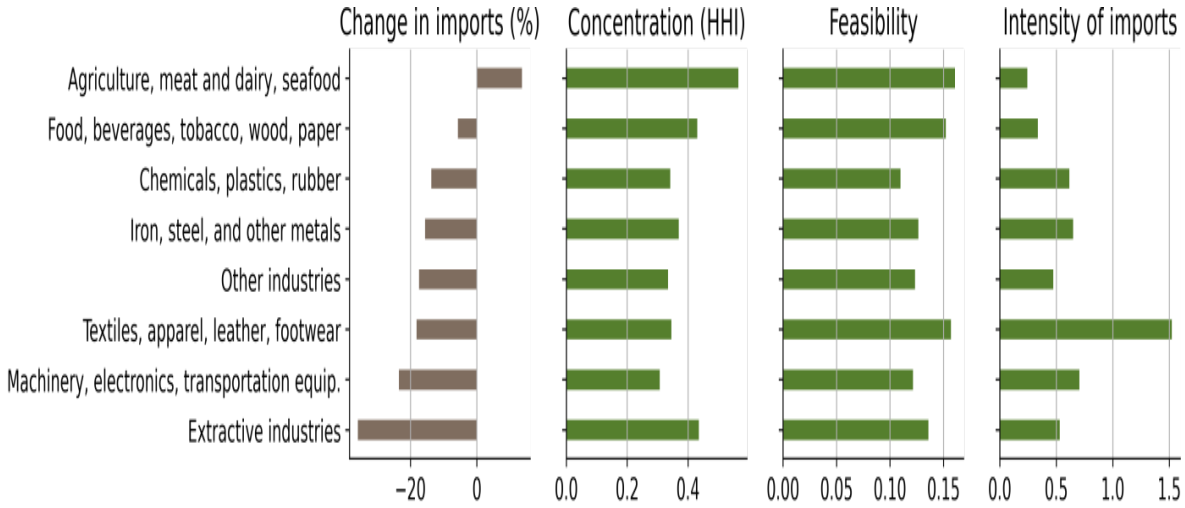
In this section, we compare the sectoral change in import values to the sectoral distribution of the scores of vulnerability factors that we defined earlier. The distribution of vulnerability indicators among sectors provides some insights as to the characteristics of these sectors. The concentration indicator HHI shows that the agricultural sector includes the less diversified products, that is, products which are imported from a limited number of countries. The machinery, electronics, and transport equipment sector is the most diverse in terms of suppliers.

Figure 4 allows comparison between imports and the three vulnerability indicators. The agricultural sector which has the highest concentration, and therefore which depends on a

limited number of suppliers compared to other sectors, recorded the only positive difference in imports. This sector has the lowest score in import intensity. Products belonging to the agricultural sector have the highest degree of feasibility relative to other sectors.

The textiles, apparel, leather, and footwear sector shows the highest score for import intensity. It also has a high feasibility score. This indicates that the sector is quite developed and that Tunisia has the factors of production necessary to produce the imported goods belonging to it. The goods belonging to the textile sector have low concentration of suppliers. The machinery, electronics and transport equipment sector has been severely affected by the pandemic. Its imports are the least concentrated. They are ranked second for import intensity, after the textiles sector. However, they are less feasible in Tunisia compared to the textiles sector. Imports of extractive industries are relatively concentrated (it comes second after the agricultural sector). The feasibility of its products is medium compared to other sectors. In terms of import intensity, it is ranked fourth.

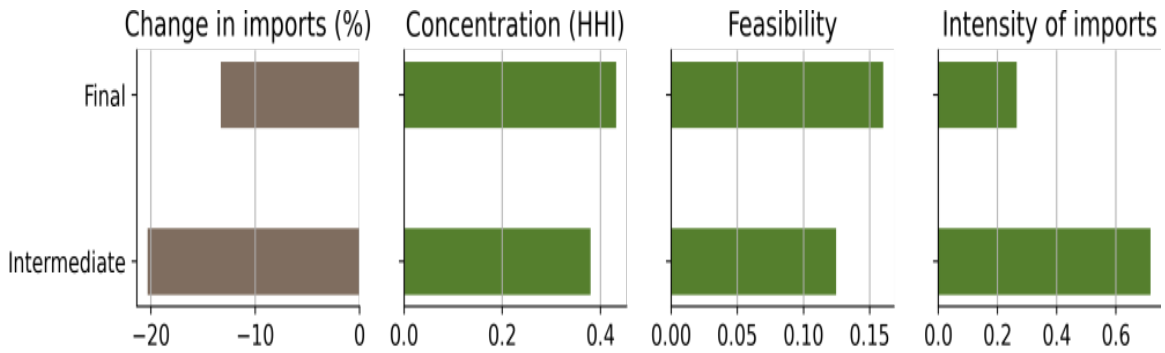
Figure 4 Change in Tunisia's trade 2019-2020 vs. vulnerability indicators



Our results show that Tunisia lacks provision of goods that are critical in time of crisis. Although products in the agricultural sector are the most feasible, imports have increased. Agricultural goods could have shown resilience if Tunisia had provisions, as we cannot have in-time outputs due to the nature of these goods, unlike textiles products.

The results show that these criteria, even if they partly explain the resilience or vulnerability of sectors, do not allow us to have a clear and precise diagnosis. These criteria must be complemented by a regression analysis to test causality.

Figure 5 Change in Tunisia's trade 2019-2020 vs. vulnerability indicators



4.2. Vulnerability vs. resilience

In this section we present the results of the clustering analysis that provides us with two distinct groups of products based on the three vulnerability criteria we have described previously. The products in the risky group are less likely to be replaced, at least in the short run, and thus, more likely to disrupt production processes if they are intermediary inputs, and to not match the demand if they are final goods. We also present some cases of health products where Tunisia has shown resilience despite the high sudden rise in demand.

K-means clustering identifies two sets of products. The first group which is vulnerable includes 1,306 goods. This group has an average HHI and import-RCA greater than the second one. The average feasibility of the first group is lower than the second. The second group includes 3,472 products. The risky or vulnerable cluster represents 19.5% of Tunisia's imports (based on import value). Table 1 shows the top 10 risky products.

Table 1 Top 10 risky products based on their share in total imports

HS2007	Sector	Description	Share of imports (%)
271121		Natural gas, in gaseous state	4,47

271129	Extractive industries	Petroleum gases & gaseous hydrocarbons, other than natural gas, in gaseous state	3,13
270900		Petroleum oils & oils obt. from bituminous mins., crude	1,62
854290	Machinery, electronics, transportation equip.	Parts of electronic integrated circuits	0,85
880240		Aeroplanes & other aircraft, of an unladen weight >15000kg	0,66
880330		Parts of aeroplanes/helicopters, other than propellers, rotors, under-carriages & parts thereof	0,65
170111	Food, beverages, tobacco, wood, paper	Cane sugar, raw, in solid form, not containing added flavouring/colouring matter	0,64
281410	Chemicals, plastics, rubber	Anhydrous ammonia	0,37
847330	Machinery, electronics, transportation equip.	Parts & accessories of the machines of heading 84.71	0,35
847130		- Portable automatic data processing machines, weighing not more than 10 kg, consisting of a least a central processing unit, a keyboard & a display	0,34

Figure 6.a shows the distribution of risky products imported by Tunisia by sector. It shows that the highest value of risky products belongs to the extractives sector, representing 51% of the total value of risky products, followed by the machinery sector (21%) and the food sector (8%). Figure 6.b shows that only 5% of risky imports are final goods while 94% are intermediate goods.

Figure 6.a Change in imports vs. distribution of risky products by sector

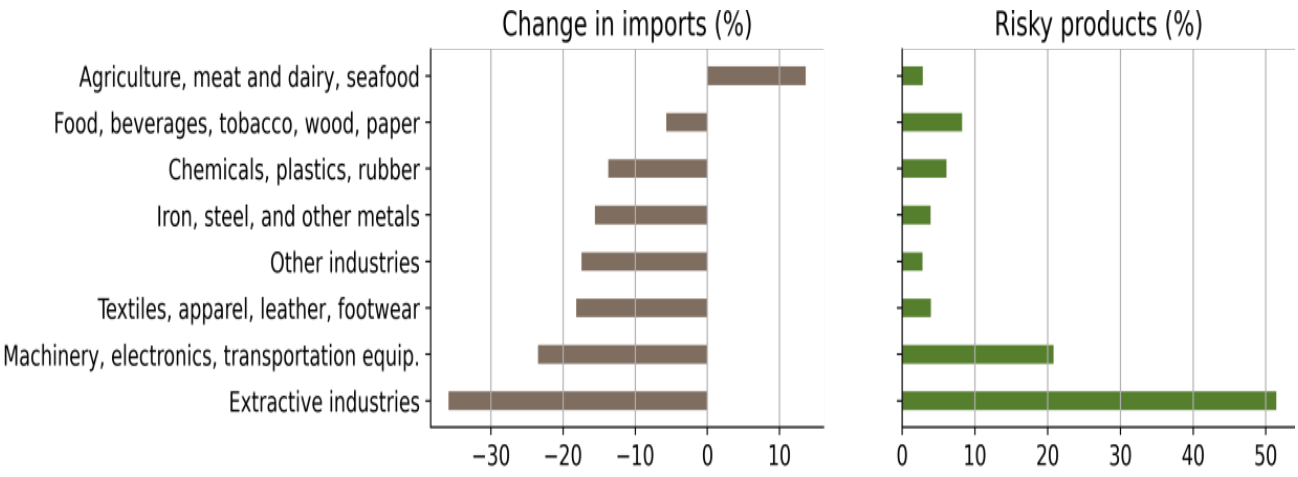
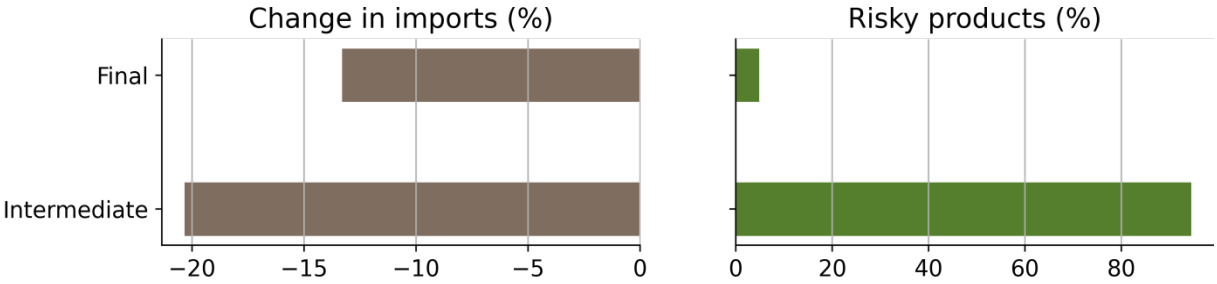


Figure 6.b Change in imports vs. distribution of risky products by end use



Based on our methodology, Algeria is the top supplier of Tunisia's risky intermediate imports. As shown in Figure 7, 8% of Tunisia's intermediate imports are risky imports coming from Algeria, while 2.2% come from France. Overall, 94% of intermediate imports supplied by Algeria are risky. On the other hand, China is the top supplier of Tunisia's risky products imported for final consumption. 0.7% of Tunisia's imported final goods are risky goods coming from China. 9% of imports of final goods coming from China are risky.

Figure 7 Share of risky imports (2019)

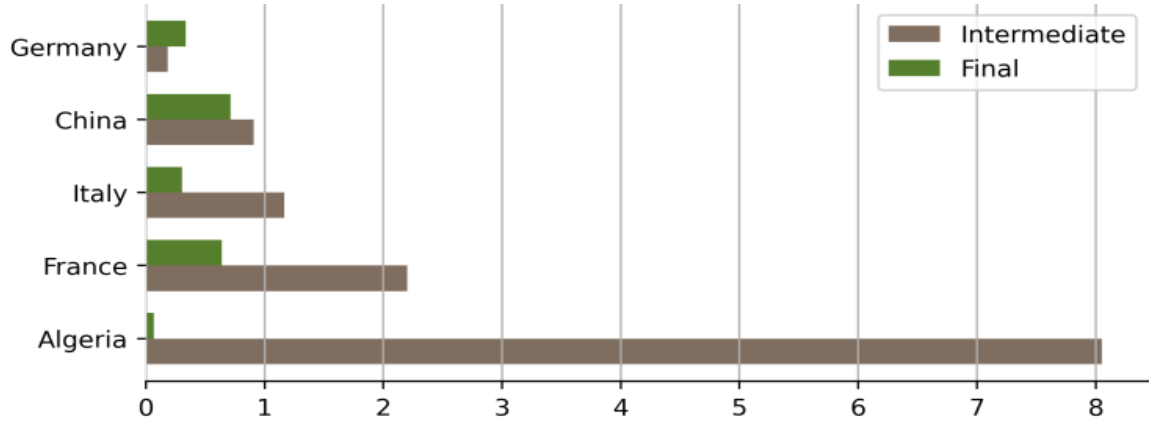
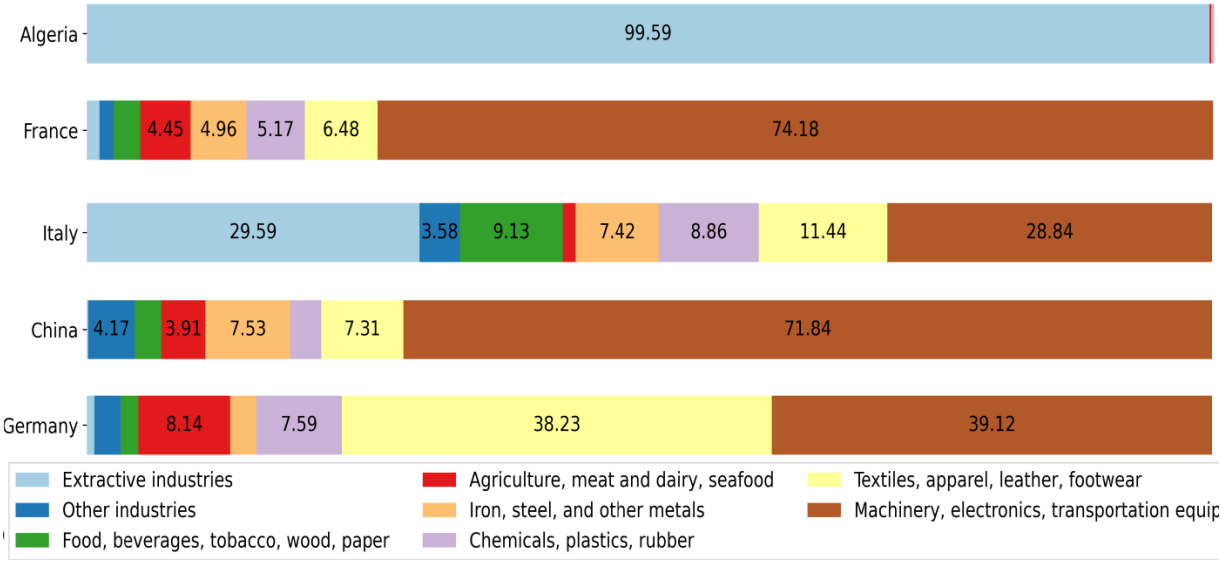


Figure 8 shows the distribution of risky imports among sectors. Although Algeria is identified to be the top supplier of risky products to Tunisia, almost one hundred percent of these products

belong to extractive industries. Unlike Algeria, France, Italy, China, and Germany exports of risky products towards Tunisia belong mainly to the sector of machinery and electronics followed by the textile sector.

Figure 8 Distribution of risky imports from Tunisia's top partners (%)[8]



Despite the huge disruption of trade, Tunisia succeeded in producing and even exporting products related to COVID-19 in response to the pandemic. Among the imported products that show a positive change, we find 27 COVID-19 products, as identified by the World Health Organization (WHO). 23 exported COVID-products experienced a positive trend. On the other hand, 46 and 40 COVID-19 products had a negative trend in imports and exports, respectively. The table in annex 1 shows the top 10 COVID-19 related goods that experienced the highest rise and highest fall in both trade flows.

Tunisia increased its exports significantly in some COVID-19 products. This suggests that the country has the potential and the resources needed to produce new goods, or to increase the volume of its current production following an increased demand.

At the same time, some products were subject to an important fall in imports. This could have two explanations. First, the restrictions that countries around the world have imposed on the export of some products related to COVID-19. Second, Tunisia managed to substitute some imports, relying on its own resources (feasibility). As an example, hand sanitizers (HS 382499) experienced 100% fall in imports, while its export value increased by 139%. Tunisia stopped

[8] The scales of the bar charts are independent.

importing certain goods and started exporting them, at the same time, satisfying both local and foreign demand. The country has shown certain resilience when it comes to COVID-19 related goods.

Some COVID-19 products showed a high increase in imports and high decrease in exports due to their critical use. As an example, imports of protective garments (HS 621030) multiplied by more than five, while exports experienced almost a hundred percent decrease.

4.3. Risky imports vs. import growth

First difference model allows us to assess the relationship between individual-specific one-period changes in the dependent variable and explanatory variables. Table 2 summarizes the results of the regressions. Column 1 presents country-month regression results, while column 2 shows the same estimation applied to country-quarter data. The results show that the coefficients associated with imports of risky products and medical products related to COVID-19 from partner countries are statistically significant in the two models.

Table 2 First difference level estimation

	(1)	(2)	(3)

	Imports change Country-Month	Imports change Country-Quarter	Imports change Country-Month
RIPC, excluding AGR and MED_COVID19 products	1.113***	1.214***	
	(0.029)	(0.036)	
RIPC, including AGR and MED_COVID19 products			1.172***
			(0.033)
AGR	0.010	0.250***	
	(0.043)	(0.080)	
MED_COVID19	6.191***	7.980***	
	(0.241)	(0.263)	
RI, excluding AGR and MED_COVID19 products	0.008***	0.012***	
	(0.002)	(0.002)	
RI, including AGR and MED_COVID19 products			0.011***
			(0.003)
R-squared	0.586	0.646	0.429
R-squared Adj.	0.585	0.645	0.429
No. observations	1707	1499	1707

Notes: estimations report the results of first difference estimator regressions.
Standard errors in parentheses. * p<.1, ** p<.05, ***p<.01Conclusion

COVID-19 pandemic proved that, like many countries, Tunisia did not show a high resilience to the trade shock that followed the unexpected disruption in global value chains and distribution channels. This work tries to explain the vulnerability of Tunisian imports to allow the implementation of the right measures that can ease the impact of the shock.

Tunisia is vulnerable to imports of many essential products, notably, agricultural products as imports of this sector experienced a significant rise in 2020 compared to 2019. To address this issue, some countries adopted exceptional and temporary measures such as reducing or eliminating the tariffs imposed on critical items, which are mainly medical supplies and food products. To prevent shortages, a solution in the long run would be to put a strategy to increase the production and build stocks of essential goods.

At the same time, Tunisia showed resilience in some activities e.g. production of face masks. Tunisia should provide support to new export activities that emerged in response to the

pandemic. As an example, textile factories in Tunisia succeeded in switching their activity to the production and export of face masks in a short time showing a high level of flexibility and agility.

A limitation of our work is that we do not consider demand or restrictions while explaining the growth of imports in 2020. Also we do not consider the effect of prices. That is, we suppose that the change in the values of imports is due to changes in quantity and not in prices.

5. Conclusion

Trade between countries has been challenged by the spread of COVID-19 pandemic resulting in the disruption of global value chains (GVCs). This disturbing incident raised concerns worldwide about the possible ways to ensure the continuity of value chains in times of disruption. To this end, we identify in this research most exposed imported products to supply chain shock based on three criteria. We consider, for each product, (1) the market concentration of Tunisia's partners, (2) the intensity of imports, and (3) the feasibility of the imported good in Tunisia. First, we classify the products imported by Tunisia into risky and less risky clusters based on the three factors of vulnerability using K-means clustering. The first group which is vulnerable includes 1,306 goods. The second group includes 3,472 products. The risky or vulnerable cluster represents 19.5% of Tunisia's imports (based on import value). 71,2% of these risky products are intermediate products. Our findings show that the highest value of risky products belongs to the extractives sector, representing 51% of the total value of risky products, followed by the machinery sector (21%) and the food sector (8%). The imports of the extractive industry and the machinery sector are the most impacted by the pandemic with a drop of 35,85% for the former and 23,45% for the latter. Algeria is the top supplier of Tunisia's risky intermediate imports. In addition, 8% of Tunisia's intermediate imports are risky imports coming from Algeria – they belong mainly to extractive industries – while 2.2% come from France. Overall, 94% of intermediate imports supplied by Algeria are risky. Moreover, China is the top supplier of Tunisia's risky products imported for final consumption i.e. 0.7% of Tunisia's imported final goods are risky goods coming from China and 9% of imports of final goods coming from China are risky.

Second, we use a first level difference estimation to evaluate if the change in the imports of risky products explain the change in total imports at the country-month and at the country-quarter level between 2019 and 2020. Our estimations show that a change in imports of risky products explain significantly the change of imports between 2019 and 2020. In addition, they show that the coefficients associated with imports of risky products and medical products

related to COVID-19 from partner countries are statistically significant meaning that a drop in COVID-19 imports from a partner country explains a decrease in imports of Tunisia from the same partner. These results should be taken with some reserves as we did not include other factors such as demand or restrictions on exports implemented by Tunisia's partner countries.

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Annex 1

Top affected COVID-19 products

Product	Change in imports/exports (%)	+ imports	+ exports	- imports	- exports
Protective garments - 621030	559,7	1	0	0	0
Medical Masks - 630790	228,7	1	0	0	0
Raw Materials to produce masks - 391610	198,2	1	0	0	0
Gloves, examination, non-sterile - 401511	161,4	1	0	0	0
Textile raw material for masks and coveralls – 560391	131,8	1	0	0	0
Raw Materials to produce masks - 600240	126,4	1	0	0	0
Gloves – 621020	100,7	1	0	0	0
Ventilators, oxygen mask and nebulizer, nasal cannula and CPAP machines - 901920	89,4	1	0	0	0
Textile raw material for masks and coveralls – 560394	81,5	1	0	0	0
Textile raw material for masks and coveralls – 560312	80,6	1	0	0	0
Nitrile and Sterile gloves - 401519	5046,1	0	1	0	0
Disinfectant - 380894	1012,8	0	1	0	0
Gloves – 621020	821,3	0	1	0	0
Gloves – 401590	480,5	0	1	0	0
Raw Materials to produce masks - 760410	194,8	0	1	0	0
Textile raw material for masks and coveralls – 560311	177	0	1	0	0
Raw Materials to produce masks - 721790	172,6	0	1	0	0
Protective garments - 621050	168,4	0	1	0	0
Hand sanitizers - 382499	139,1	0	1	0	0
Medical Masks - 630790	122,7	0	1	0	0
Hand sanitizers - 382499	-100	0	0	1	0
Protective garments - 611300	-93,7	0	0	1	0
CT systems - 902212	-71,7	0	0	1	0
Raw Materials to produce masks - 600290	-61,7	0	0	1	0
Protective garments - 621040	-60,3	0	0	1	0
Bougies, catheters, drains and sondes, and parts – 901839	-57,3	0	0	1	0
Raw Materials to produce masks - 760429	-48,9	0	0	1	0
Raw Materials to produce masks - 391620	-47,9	0	0	1	0
Other medical headwear - 650610	-47,9	0	0	1	0
Protective garments - 621149	-47,8	0	0	1	0
Protective garments - 621030	-99,9	0	0	0	1
Sharps container boxes - 392329	-87,5	0	0	0	1
Textile raw material for masks and coveralls – 560312	-86,4	0	0	0	1
Raw Materials to produce masks - 391690	-76,2	0	0	0	1
Liquid Soap - 340130	-72,3	0	0	0	1
Ventilators, oxygen mask and nebulizer, nasal cannula and CPAP machines - 901920	-66,1	0	0	0	1
Chlorine – 390421	-66	0	0	0	1
Patient monitors and pulse oximeters - 901819	-65,5	0	0	0	1
Full face mask filters anti-aerosol FFP3 - 842199	-63,8	0	0	0	1
Other medical headwear - 650610	-50	0	0	0	1