



IRPET Istituto Regionale
Programmazione
Economica
della Toscana



To what extent are the Italian regional food systems vulnerable to (climate) shocks? The case of wheat

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SEEDS Annual Conference, 28-30 Maggio 2025,
Università Cattolica del Sacro Cuore di Milano

Aims and objectives

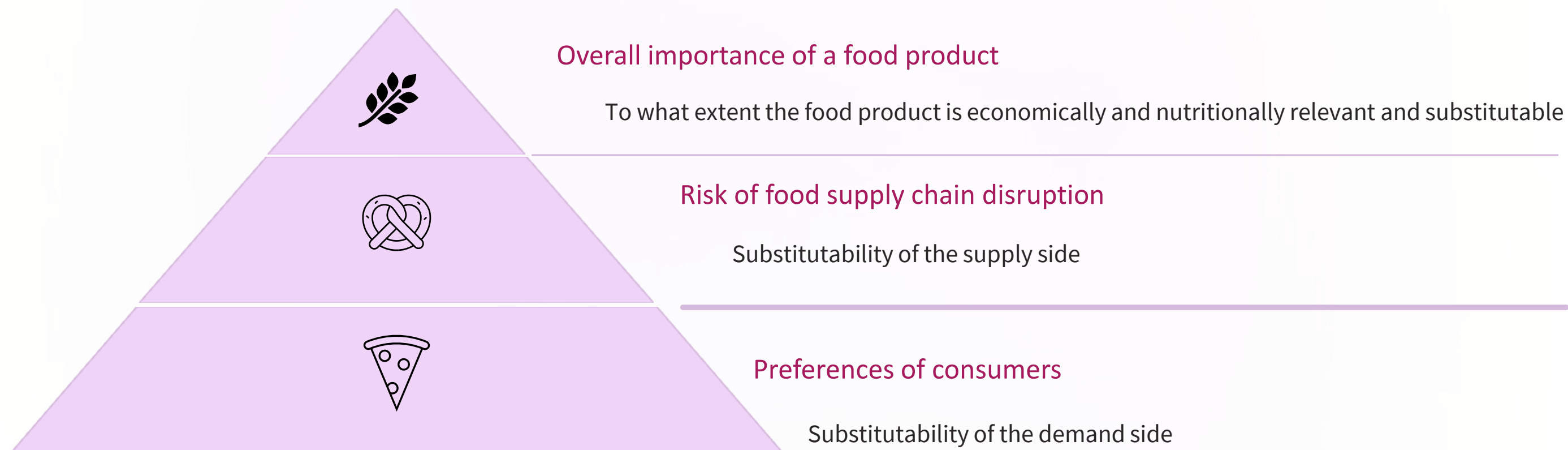
Food value chains are particularly vulnerable to climate shocks, which are expected to dramatically grow in number and intensity in the very next years (e.g., FAO, 2021). They are generally not predictable and geographically dispersed. Moreover, in the last few years, many other types of shocks occurred (e.g. geo-political) with relevant impacts on the provision of food and prices. Since countries are more and more dependent on imports for their food security, their vulnerability is likely to increase.

This study presents an innovative **multi-level analysis framework** that reconstructs the value chains activated by food consumption in Italian regions and assesses their exposure to different types of risk. The approach integrates an interregional **Supply and Use table (SUT)** with a food satellite account, spatial information on crops and firm-level data.

Our analysis focus on the case study of **durum wheat** and **common wheat**, staples of the Mediterranean diet, characterized by a low degree of substitution because of its intrinsic properties for industrial processing. Despite their resistance to drought, the effects of climate change and geopolitical crises could have significant consequences on global production and availability.

Methodology:

Ex-ante evaluation of “criticality” of a food product



The evaluation framework is adapted by the European Commission approach, which defines as critical those materials which are crucial to some industries, based on the share of net demand and the gross added value generated by them. Moreover, they are critical when their supply is at risk (CE, 2023; Blengini et al., 2017)

Methodology:

The multi-level framework analysis

Macro: interregional-international SUTs

Interregional SUTs supplemented with **BACI-CEPII international trade data**, allowing disaggregation of traded products down to 6 digits in HS nomenclature.

Meso: Agri-food satellite account

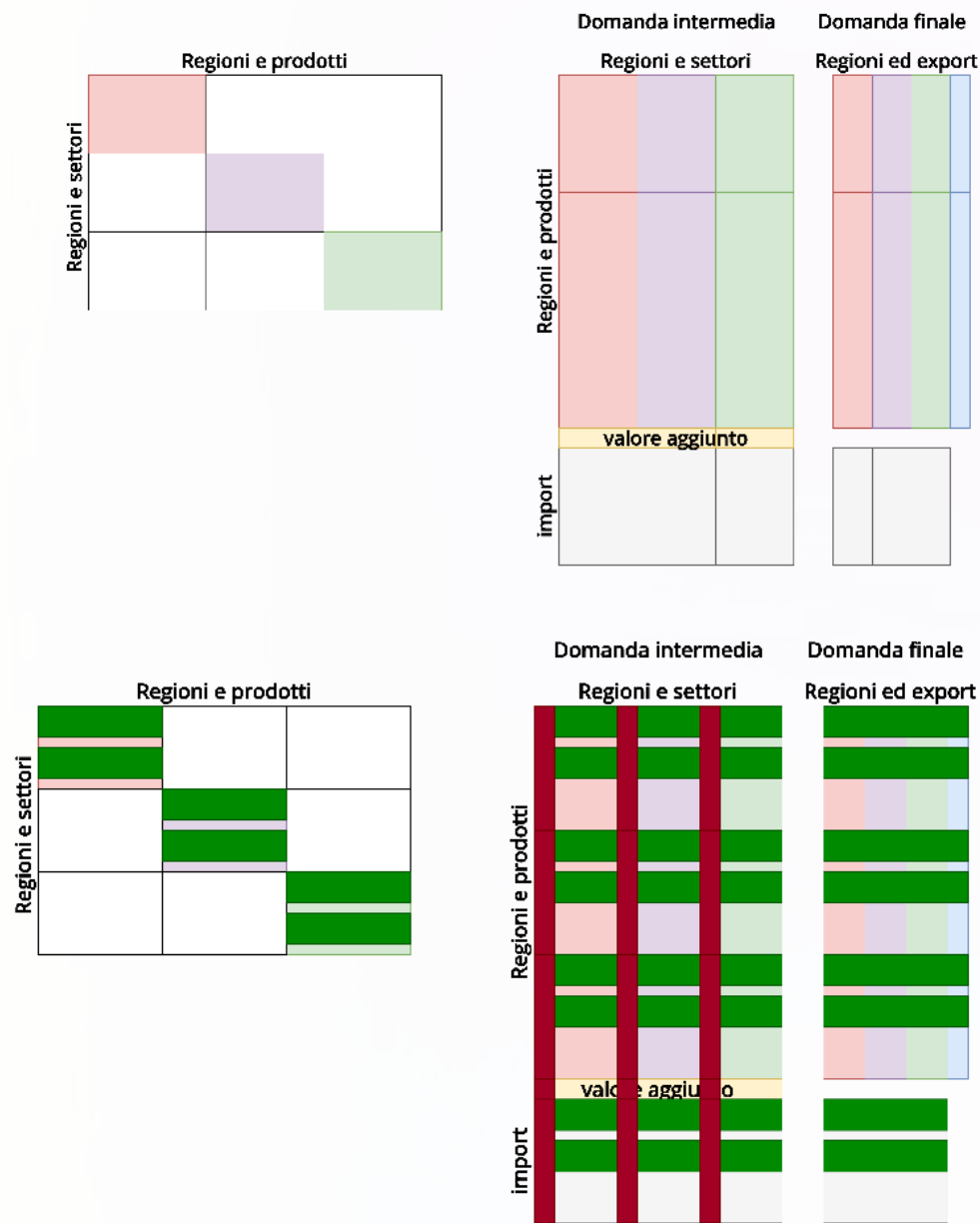
Disaggregation of agricultural and food production of the different regions in both sectoral and product terms, using **Agriculture Accounts (ISTAT), FADN, Asia Agriculture, PRODCOM and other databases.**

Micro: Spatial and firm disaggregation

Analysis of the spatial distribution of agricultural production and microeconomic characteristics of farms, **integrating tax data, AIDA and other information sources.**

This multi-level approach allows to consider the complexity of the value chains, due to the variety of diets among different regions, the geographical dispersion of production, the length of the supply chains and the heterogeneity of the actors involved.

Methodology: The food satellite account



Inter-regional-international SUT: Italian regions (Paniccià, 2024) have been included within the international information set FIGARO SUT (Remond-Tiedrez and Rueda-Cantuche, 2019) and then ‘augmented’ with BACI-CEPII international trade data(which allow for the disaggregation of products traded down to 6 digits in the HS nomenclature)

Agri-food satellite account: disaggregation of the agricultural and food production of the different regions in both in sectors and products; as is the final consumption of households in an inter-regional SUT framework

Wheat as a critical product



Base product of many Mediterranean diets

Nutritionally relevant

Low level of substitutability on the demand side



Relevant intermediate input

Economically relevant for Italian food industries, contributing to GDP growth and exports of final Made in Italy products



Concentration of global production into few countries/
exposure on global markets

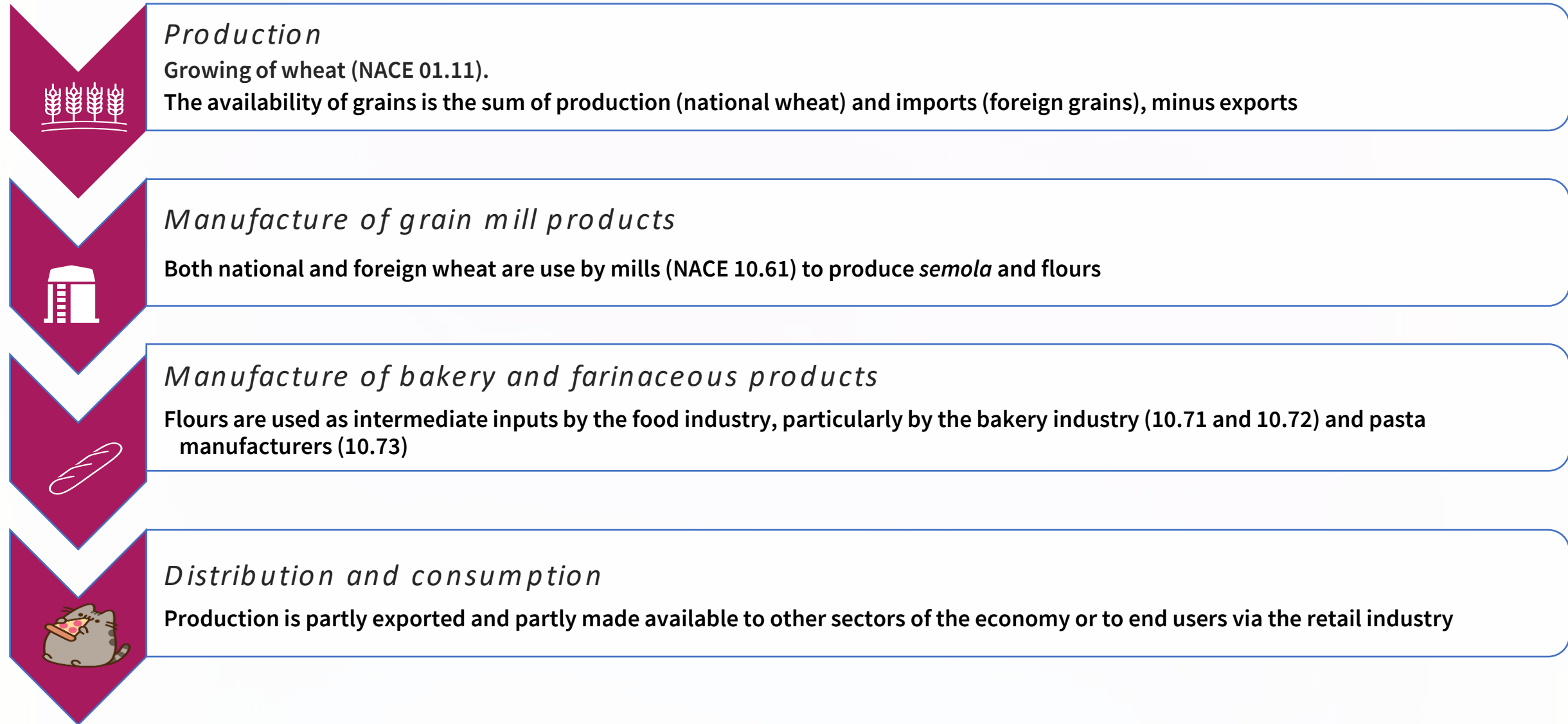
Local shocks (e.g. geopolitical crises, protectionism) can highly impact on global production and prices (Devadoss, Ridley, 2024; Mottaleb et al., 2022)



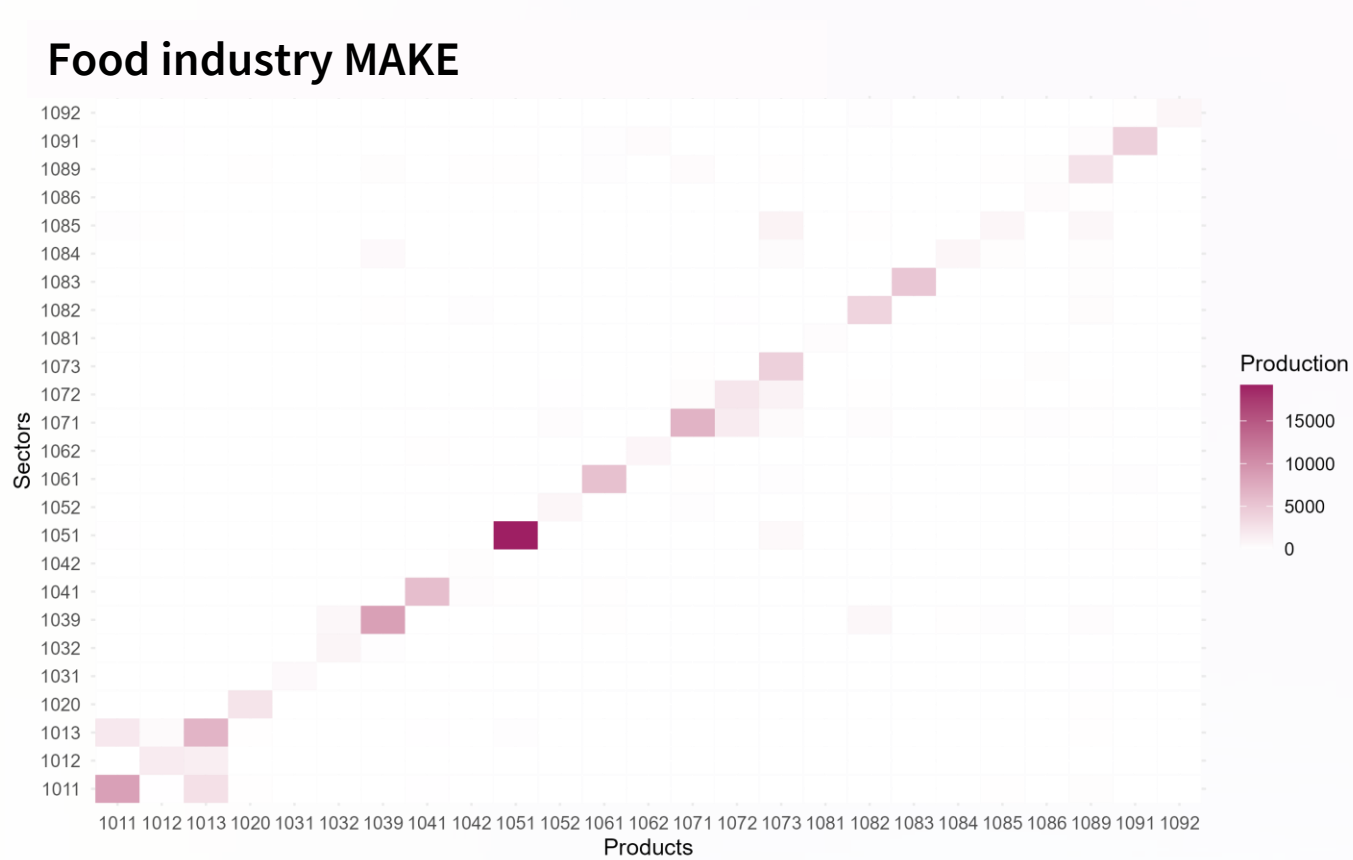
Mixed and blurred effects of climate change, especially in Southern regions
(Zhang et al., 2022; Xiong et al., 2020; Liu et al., 2016)



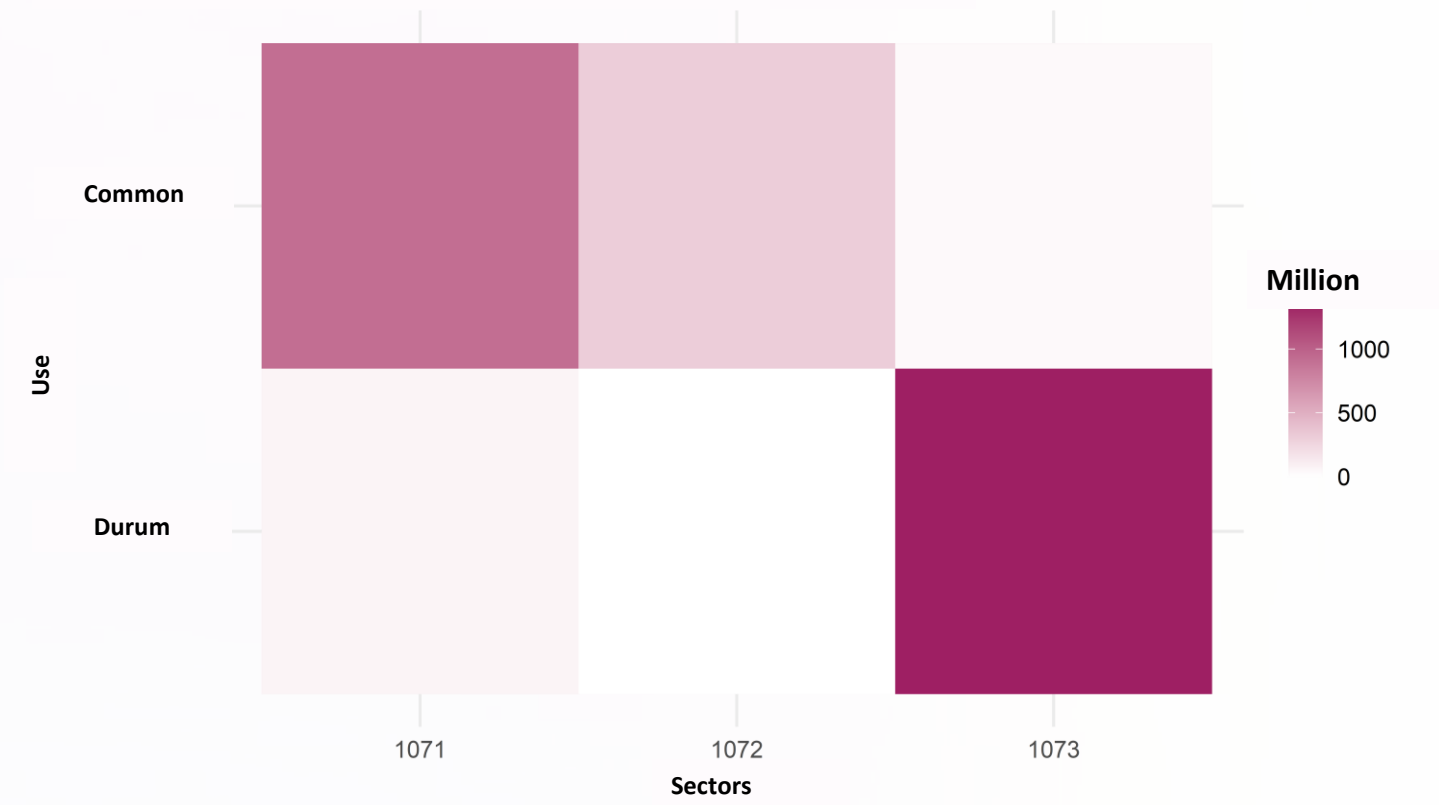
The wheat value chain in Italy



The wheat value chain according to the food satellite account



Food industry USE



Flour as intermediate input



Manufacture of bread and fresh pastry goods and cakes (10.71)



Other bakery products (10.72)

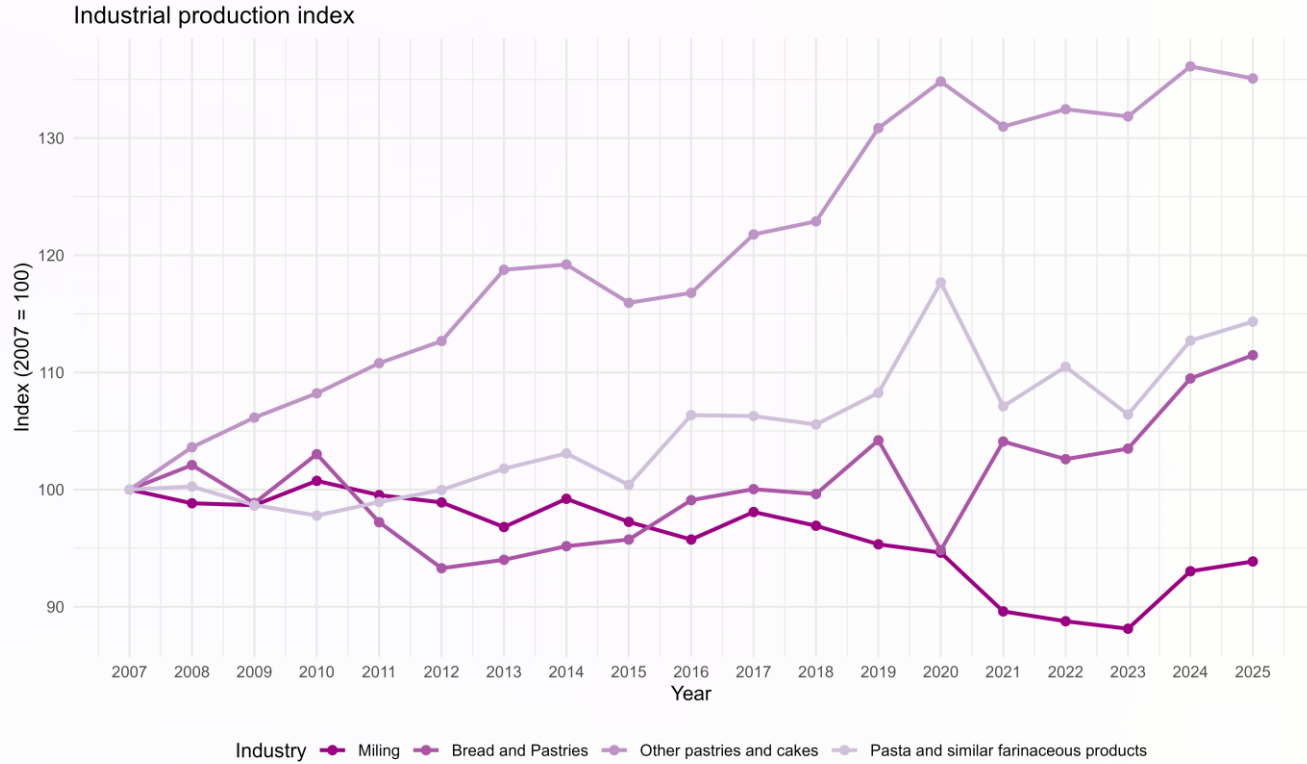
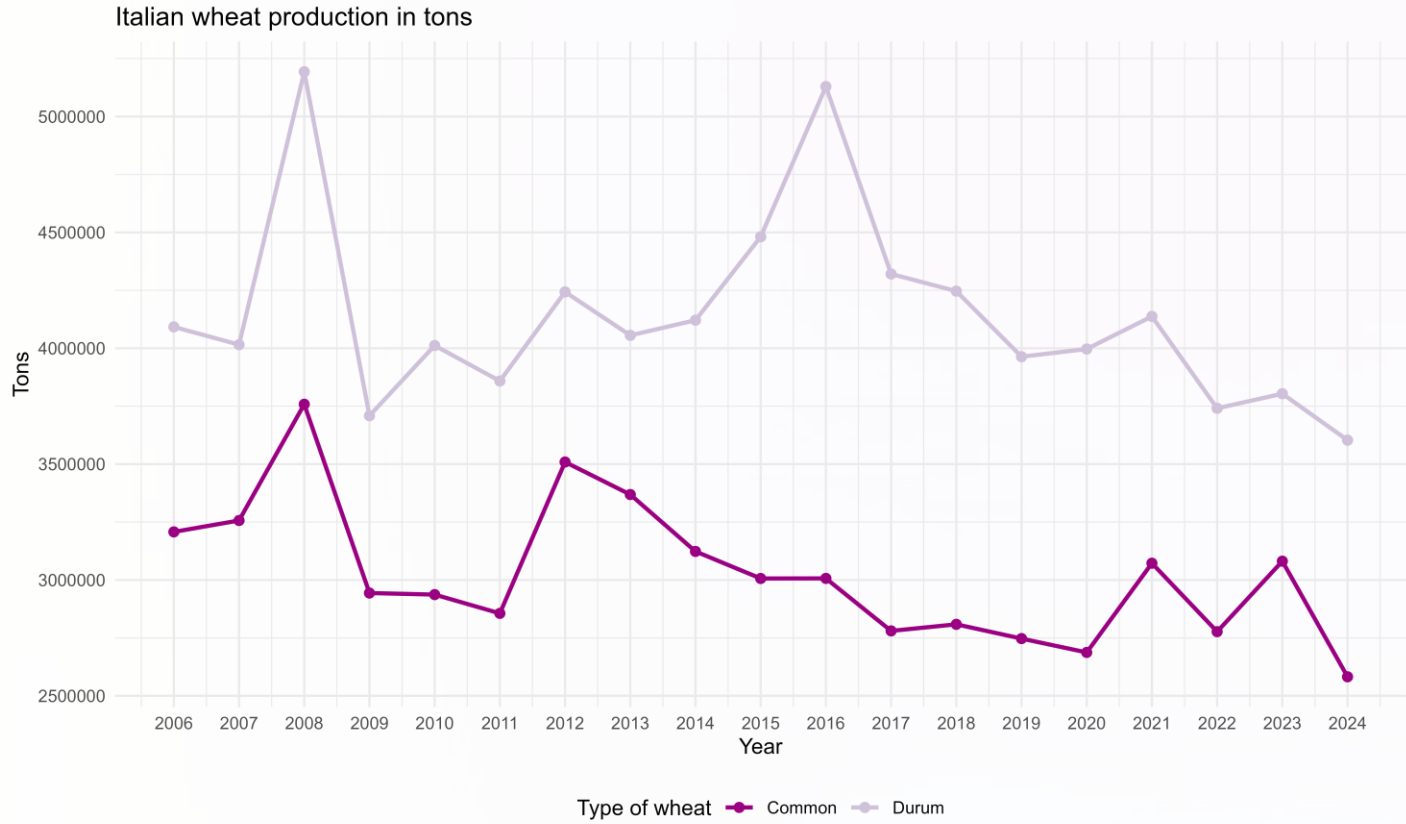
These sectors of bakery products mainly use common wheat flour, exploiting the elasticity of dough that this variety guarantees.



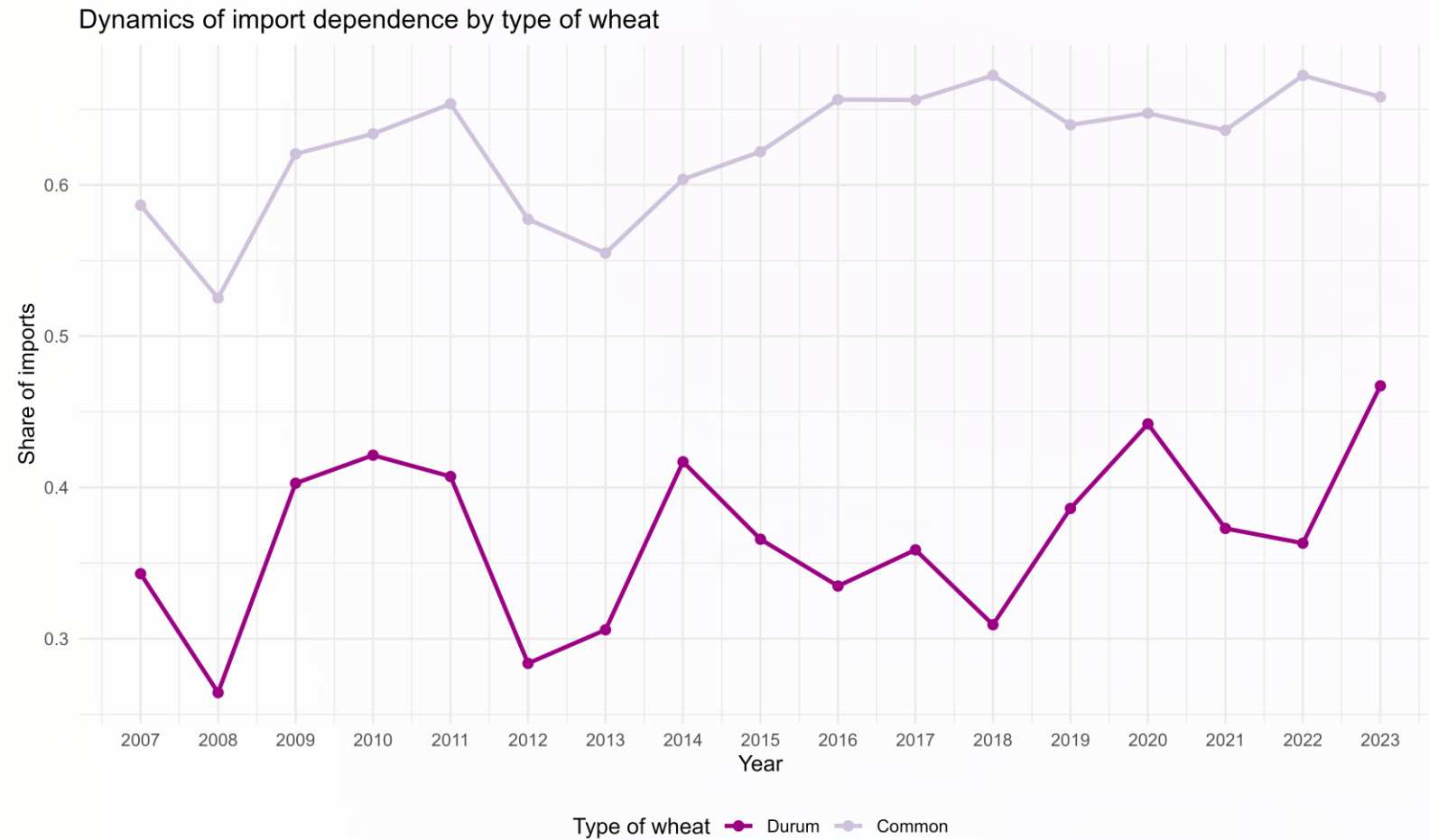
Manufacture of pasta (10.73)

This sector almost exclusively uses durum wheat flour (so-called *semola*), due to its high protein and gluten content. Italian pasta production is strongly export-oriented, representing a leading *Made in Italy* product.

Trends in wheat and industrial production



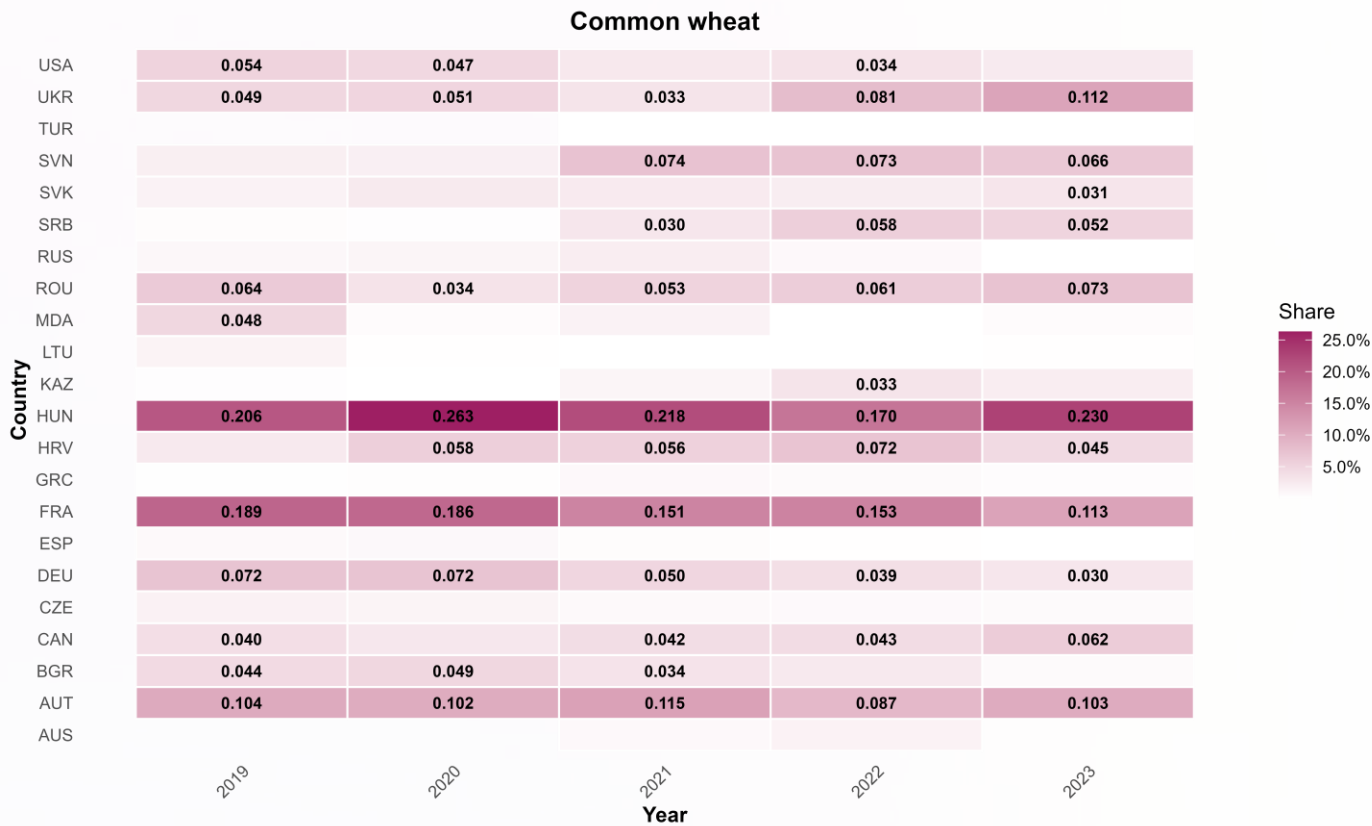
The import dependency



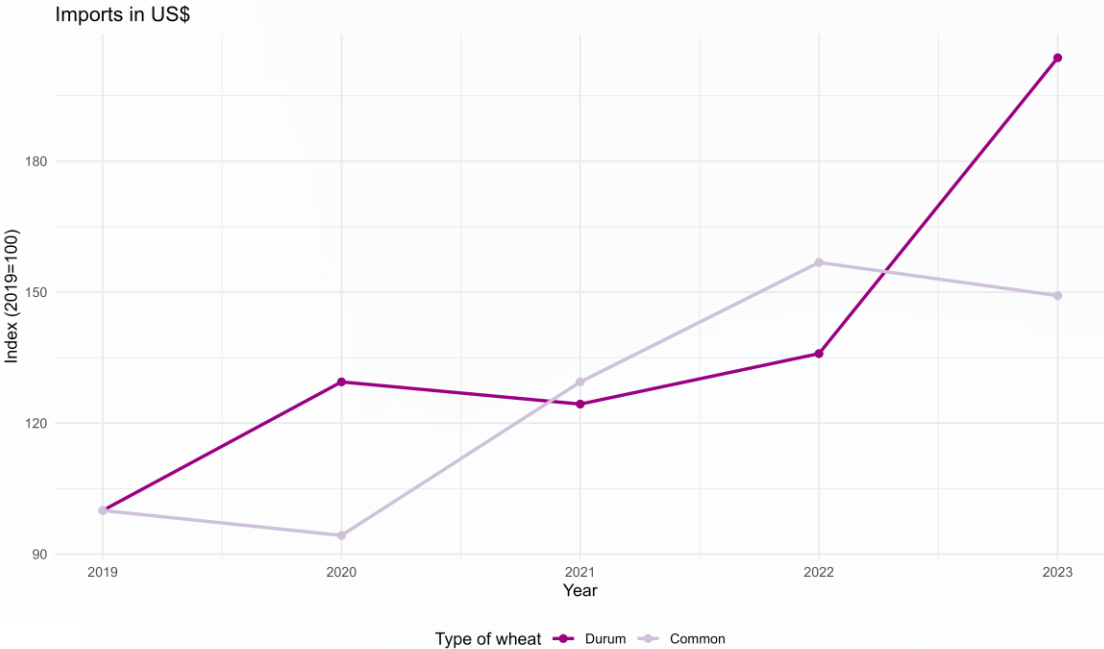
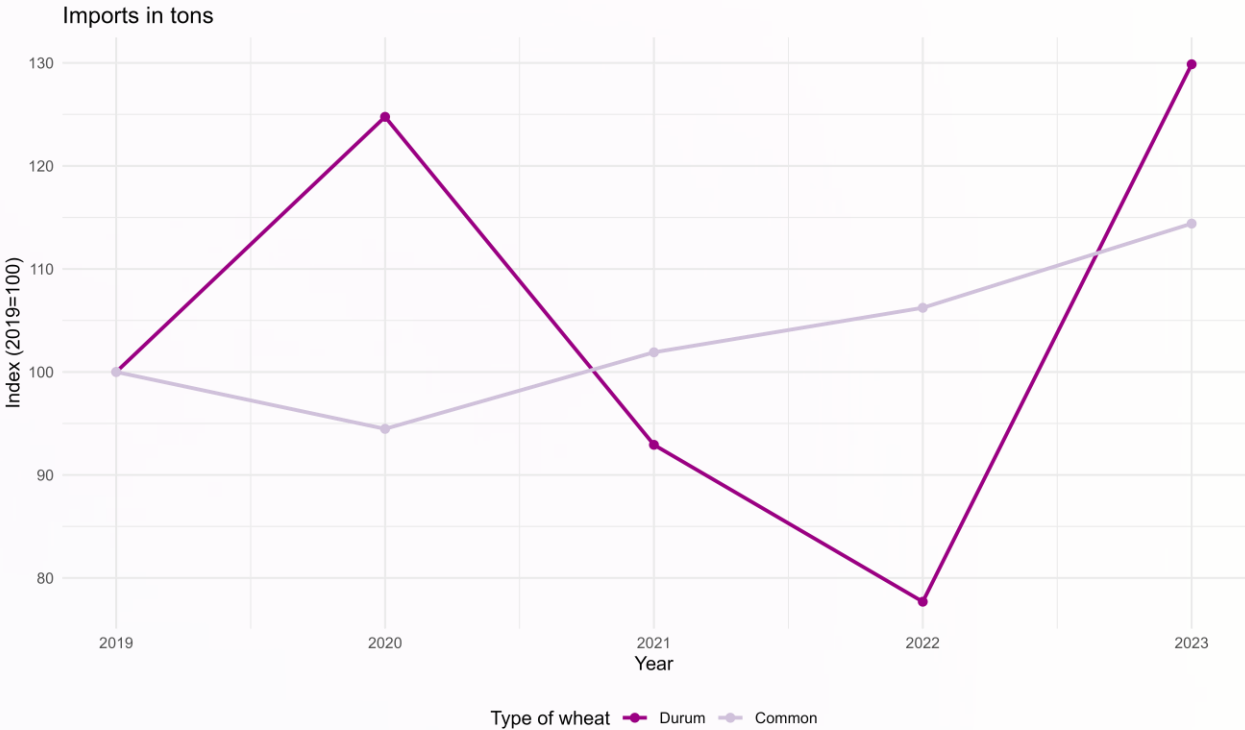
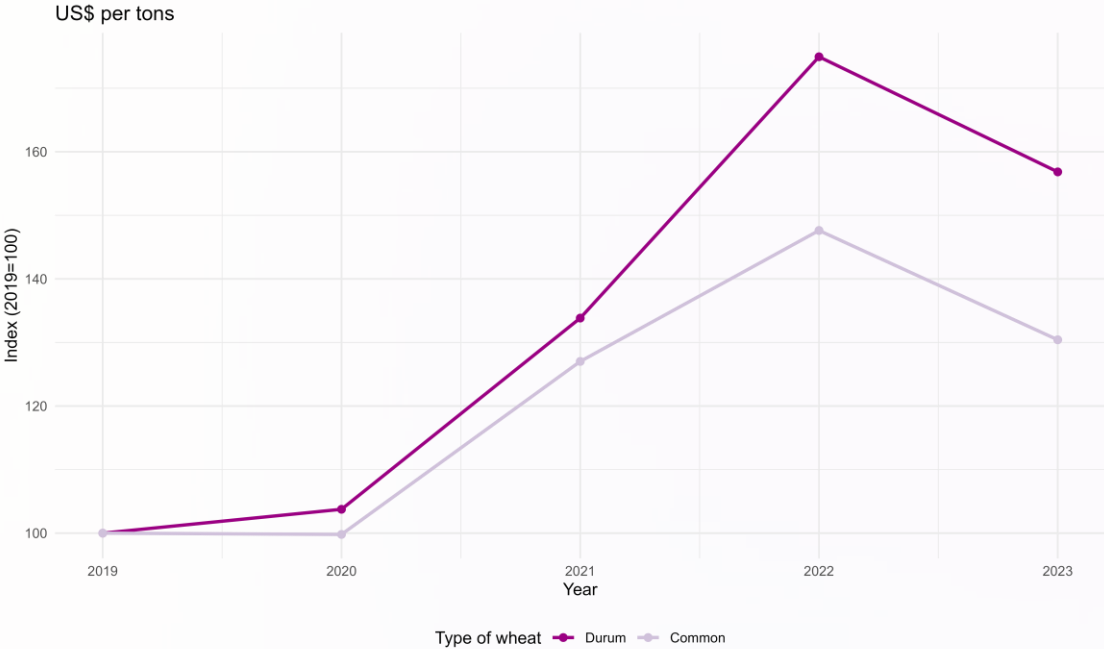
Despite its limited physical size and a declining agricultural sector, Italy is a relatively large producer of wheat, accounting for **1% of global production**. Being also a large user, it remains a net importer.

Over time import dependency increased. We are mainly dependent on the import of common (70%) but today the dependence on foreign durum ranges between 35% and 45%.

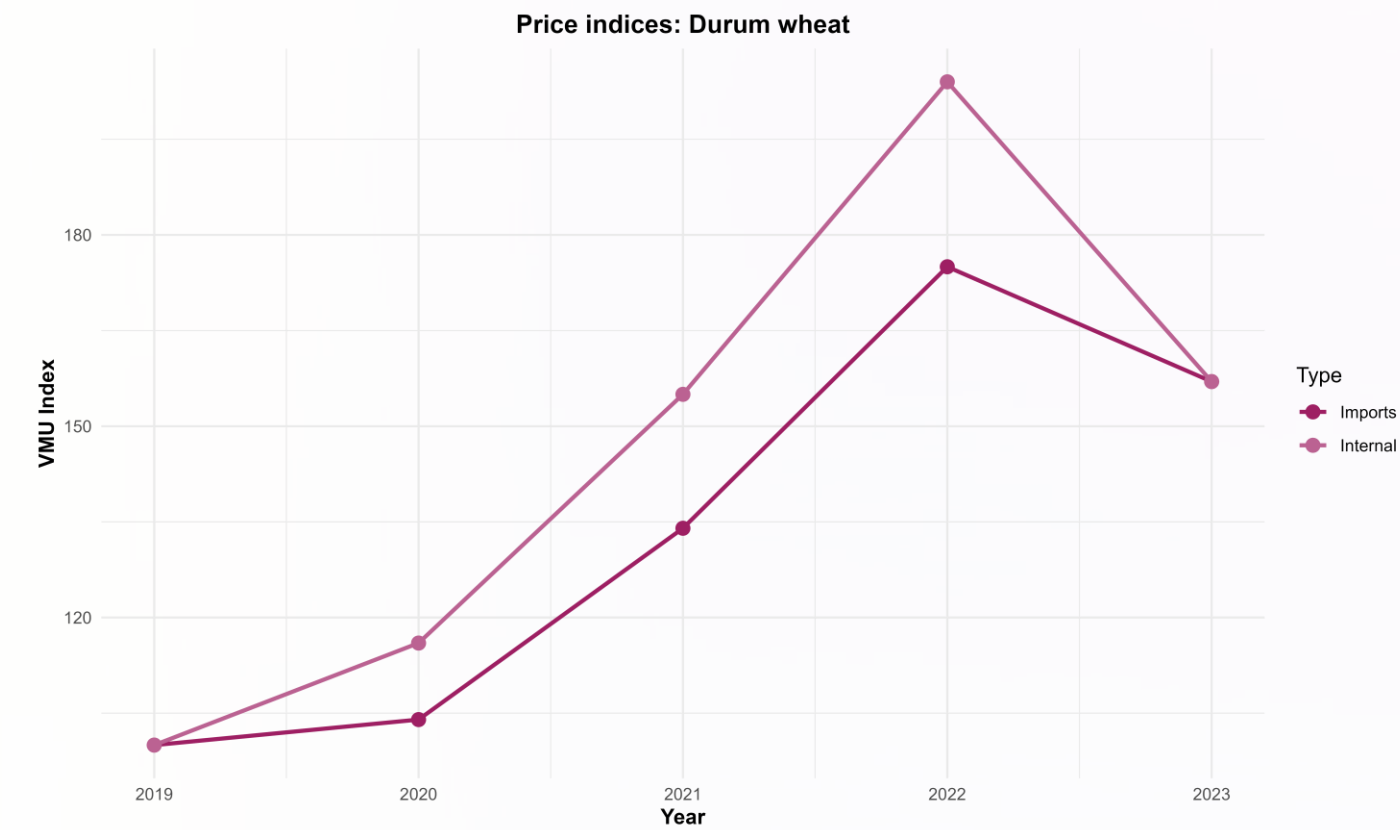
Recent shocks: *the geography of wheat*



Recent shocks: *trends*



Recent shocks: *prices*

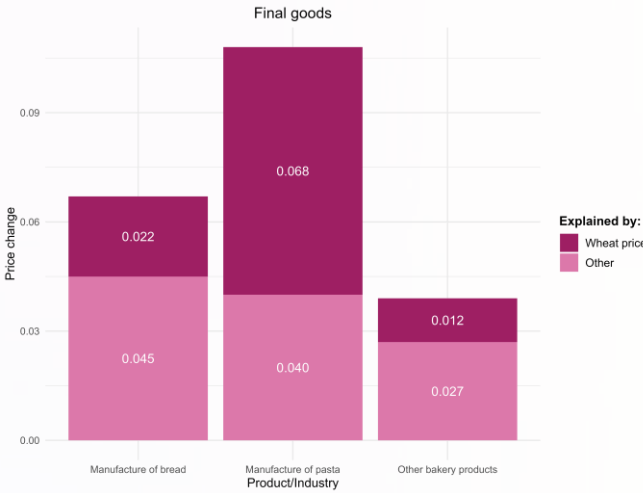
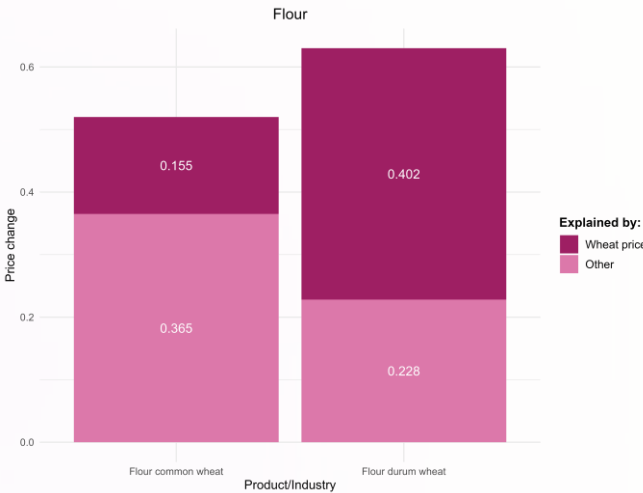
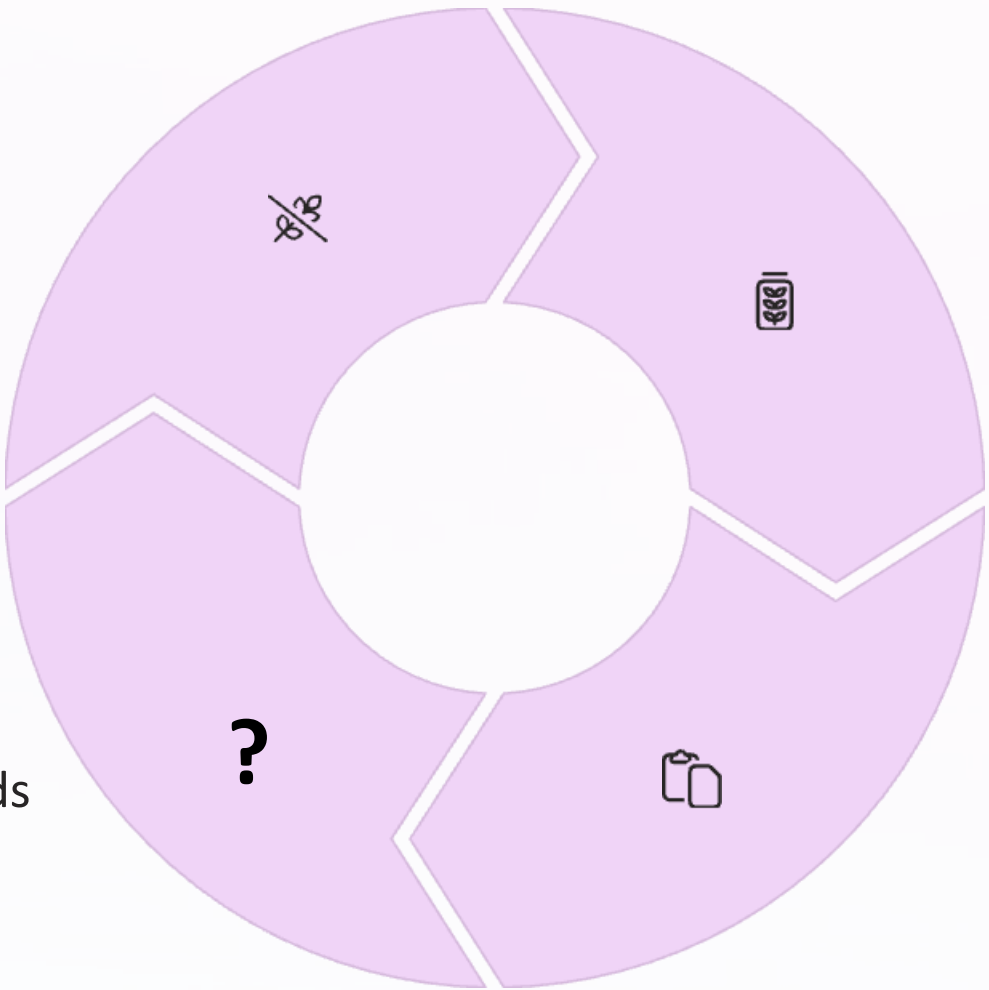
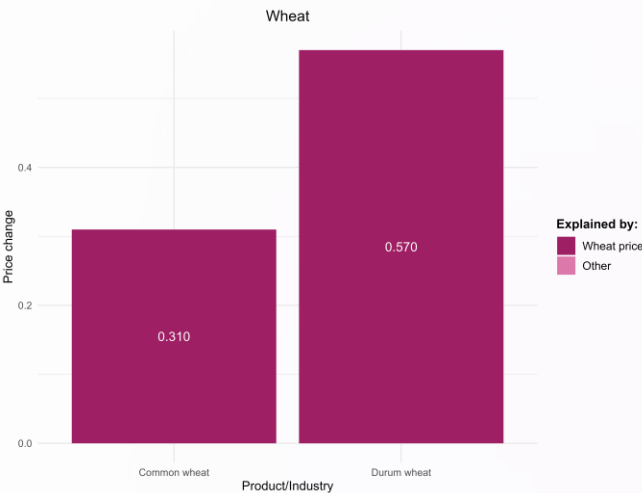


Recent shocks: *effects*



We employ a Leontief cost-push model to simulate the impact of the prices of the final products generated by the observed increase in the cost of wheat. The model generates cascading effects over the value chains under the assumption of i) stable demand; ii) stable value added coefficients

Recent shocks: *effects*



Recent shocks: *results*

The increase in wheat prices has been passed on to the downstream sectors, particularly affecting the durum wheat value chain (+7% for pasta), compared to a smaller increase for the other two sectors (2.2% for bakeries and 1.2% for other bakery products).

Other sources of increases of prices which have not been investigated - such as energy - have also contributed to the rising prices of the final products.

The impact on consumers remains to be assessed, depending on the behavior of wholesale and retail sectors.

Concluding remarks

Over time the dependency of Italy on wheat imports has increased, especially for durum which is largely cultivated in the Southern regions. Imports compensated for stagnating domestic production over time.

The increased dependency raises the exposure of Italy to external shocks, both geopolitical and climatic, so as to challenge both food security and a relevant part of our Made-in-Italy labelled economy.

Using a multi-level framework, we reconstructed the Italian wheat value chains for both durum and common and then simulate the impacts of recent shocks. Starting with the wheat price shock, we simulated the contribution to price growth downstream. The results showed that the contribution to price growth was higher for durum wheat products, confirming that increased exposure to the global market can affect the provision of very critical products.

Next steps

For the multi-layer assessment framework:

- Completing the estimation of the food satellite account connecting the regional household food consumption basket, the disaggregated intermediate input table, and the disaggregated make matrix
- Adding more regions to the spatial and to the microeconomic layers of the assessment framework

For the wheat case study:

- Investigate the role played by the wholesale and retail sectors in determining the final impact on households
- Investigate whether different sectors of the supply chain were able to transmit cost increases differently through price increases
- Investigate the role played by international prices of durum vis-à-vis common wheat in shaping the dynamics of internal prices