Resisting Foreign Competition in the Food Industry
Labor Costs vs. Product Quality

Work in progress

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1. Introduction

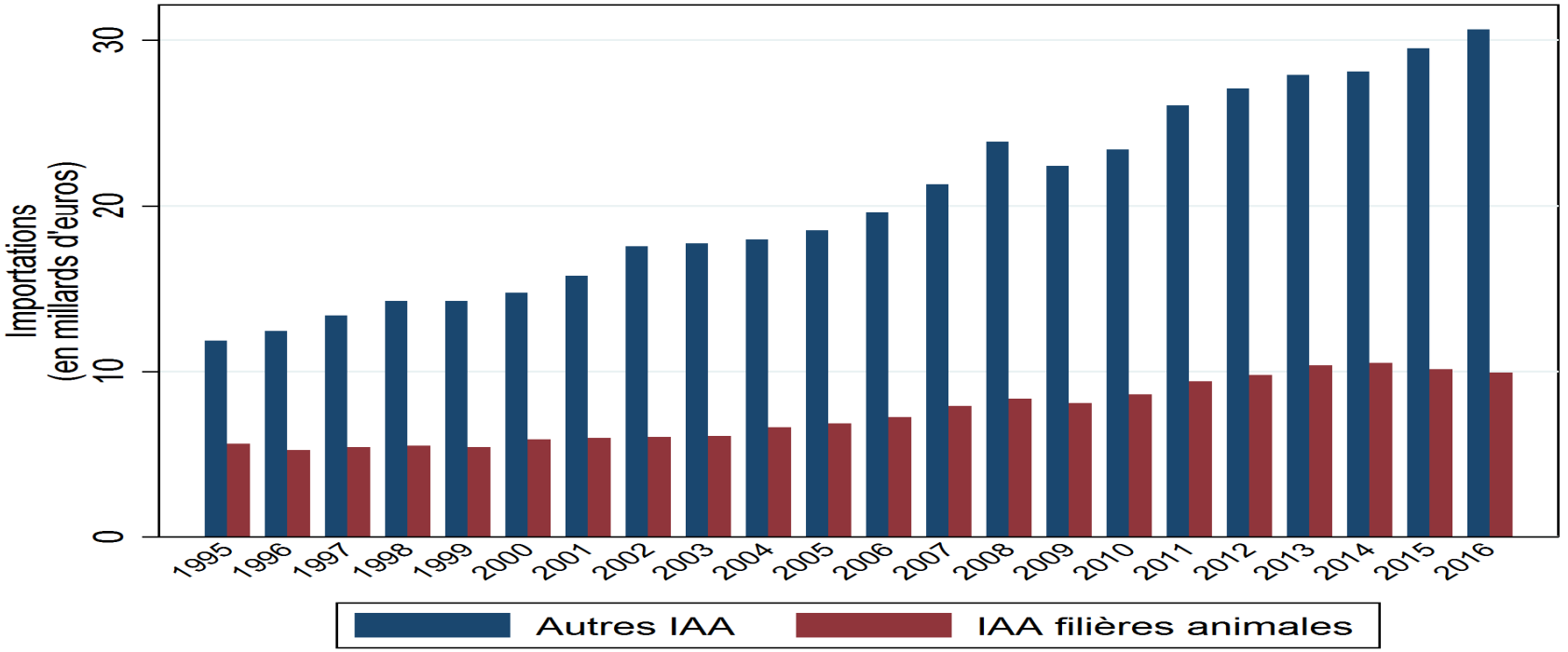
▪ Motivation

- Domestic food industries has exposed to a more intense international competition

→ higher share of food domestic demand is satisfied by foreign products

(France: from 10% in 1980, to 17% in 2000 to 23% in 2019)

Change in Imports – Food products – France



- Many countries, such as the US and the EU, aim to lower import competition by restoring the competitiveness of their domestic industries
  - Lowering tax 'burden' on labor and capital
  - Trump trade policy (tariff war)
  - Reducing dependence on foreign sources (key issue since the COVID-19 pandemic)

- There is a lively debate about how restoring industries' competitiveness.
  - cost-competitiveness → *labor cost*, *productivity*, *material cost*
  - non-price competitiveness → *product characteristics* → *taste* & *product quality*

- Strong policy implications

BUT, we lack empirical evidence on the respective impact of cost-related and quality-related competition on trade patterns.

▪ Objective

We assess the relative role of price and non-price competitiveness factors on the ratio of imports to domestic demand

by developing a structural gravity equation

by addressing the potential endogeneity bias (like in traditional demand models)

by exploiting variations across industries, across countries, and over time

We perform several counterfactual exercices to evaluate the changes in import competition due to a change in labor cost, productivity, and product quality in France.

Results

- cost and non-price competitiveness are important determinants of imports in the food industry.
- Market access costs, border effect, appear particularly important and their effects exceed those of competitiveness factors.

▪ Literature

Empirical studies focus on exports (competition across countries to serve a foreign country)

- Labor costs and export performance [Altomonte et al. (2012), Decramer et al. (2016), Gan et al. (2016), Malgouyres and Mayer (2018)]

  → The effect of unit labor costs is rather low.

- Quality and export performance [Crozet et al. (2012), Curzi and Olper (2012), Duvaleix-Treguer et al. (2021)]

  → Positive relationship between product quality and export performance.

Une synthèse : Gaigné C., K. Latouche, S. Turolla (2020) Compétitivité internationale du secteur agroalimentaire français : c'est quoi le problème ? *Annales des Mines - Réalités industrielles* 2020/2 (Mai 2020) https://www.cairn.info/revue-realites-industrielles-2020-2-page-21.htm

2. Empirical Strategy: a (*ratio-type*) structural gravity approach

- Proxy for the import competition pressure in country i from country j for product k:

$$\mathcal{R}_{ji}^{k} = \frac{\mathrm{M}_{ji}^{k}}{\mathrm{M}_{ii}^{k}}$$

  - M_{ji}^{k} bilateral imports in product k (of country i from country j)
  - M_{ii}^{k} trade with itself (consumption of domestic products).
  - $\Sigma_j \mathcal{R}_{ji}^{k} = 0$ implies self-sufficient in product k

- $\mathrm{M}_{ji}^{k} = \sum_v m_{ji}^{k}(v)$ with $m_{ji}^{k}(v)$ import demand in country i for a variety v of product k produced in country j, which depends on 'quality'-adjusted price

$$m_{ji}^{k}(v) = \Lambda_{i}^{k} \times [p_{ji}^{k}(v) \,/\, \lambda_{ji}^{k}(v)]^{-\rho^{k}}$$

  - Λ_{i}^{k}: the size of market potential,
  - $p_{ji}^{k}(v)$is the price of the variety paid by the consumer
  - $\lambda_{ji}^{k}(v)$is a demand shifter (taste & quality}
  - ρ^{k} represents the *trade elasticity* (~ elasticity of substitution)

$$m_{ji}^{k}(v) = \Lambda_{i}^{k} \times [p_{ji}^{k}(v) \,/\, \lambda_{ji}^{k}(v)]^{-\rho^{k}}$$

- Inside price competitiveness. The price paid by consumers:

$$p_{ji}^{k} = p_{j}^{k} \times \tau_{ji}^{k}$$

  - p_{j}^{k} : the factory-gate price with $p_{j}^{k} = \text{markup}^{k} \times \text{mc}_{j}^{k}$ with

$$\text{mc}_{j}^{k} = (\omega_{j}^{k})^{\zeta_{\ell}^{k}} r^{\zeta_{\kappa}^{k}} (\mathcal{P}^{k})^{\zeta_{p}^{k}} \,/\, A_{j}^{k}$$

  with A_{j}^{k} a productivity shifter and ω_{j}, r, and $\mathcal{P}^{k}$ are unit prices of labor, capital, and aggregate intermediate good, respectively.

  - τ_{ji}^{k} trade costs with $\tau_{ji} = d_{ij}^{\delta^{d}} \exp\left[B_{ij} \left(\delta^{b} - \sum_{x=1}^{x} \delta^{x} z_{ij}^{x} \right) + e_{ji} \right]$

where

- d_{ji} is the distance between two trading partners
- B_{ij} : a dummy variable equal to 1 for i≠j, (a home-bias effect)
- z_{ij}^{x} a X-dimensional vector of trade promoters (common language, common religious,…)
- e_{ji} is a random component that is normally distributed.

$$m_{ji}^{k}(v) = \Lambda_{i}^{k} \times \left[p_{ji}^{k}(v) \,/\, \lambda_{ji}^{k}(v)\right]^{-\rho^{k}}$$

- Inside non-price competitiveness. The product appeal:

$$\lambda_{ji}^{k}(v) = \underbrace{\left[\theta_{j}^{k}(v)\right]^{\beta_{i}^{k}}}_{\text{quality}} \times \exp\underbrace{\left[-\mathrm{B}_{\mathrm{ij}}\left(\gamma^{b} - \sum_{x=1}^{X}\gamma^{x}\mathrm{z}_{\mathrm{ij}}^{x}\right) + \nu_{ji}^{k}\right]}_{\text{taste}}$$

where

- $\theta_{j}^{k}(v)$ represents the quality of variety (vertical differentiation)
- β_{i}^{k} : degree appreciation for vertically differentiated products
- ν_{ji}^{k} is an idiosyncratic error term.

- Aggregation: from variety/firm level $m_{ji}^{k}(v)$ to industry level M_{ji}^{k}

Free entry implies that the number of producers is

$$n_{j}^{k} = \frac{\nu_{j}^{k}}{p_{j}^{k} \times A_{j}^{k}} \frac{1}{\rho^{k} F^{k}} \quad \text{so that} \quad \mathrm{M}_{ji}^{k} = n_{j}^{k} \times m_{ji}^{k}$$

where ν_{j}^{k} is the value of production in industry k and in country j ($\rightarrow$ *data*)

Equation to be estimated ($\mathcal{R}^k_{ji} = \mathrm{M}^k_{ji} \,/\, \mathrm{M}^k_{ii}$)

$$\ln \mathcal{R}^k_{ji,t} = \text{const} + \ln\left(\frac{\nu^k_{jt}}{\nu^k_{it}}\right) + \sum_{x=1}^{X} \mu^x_{\mathrm{z}} z^x_{ij} + \mu_{\mathrm{d}} \ln\left(\frac{d_{ij}}{d_{ii}}\right) + \mu_\omega \ln\left(\frac{\omega^k_{jt}}{\omega^k_{it}}\right) + \mu_A \ln\left(\frac{\hat{A}^k_{jt}}{\hat{A}^k_{it}}\right) + \mu_\theta \ln\left[\frac{(\hat{\theta}^k_{jt})^{\beta^k_i}}{(\hat{\theta}^k_{it})^{\beta^k_i}}\right] + \varepsilon^k_{ji,t}$$

- μ_ω, μ_A, μ_θ are the parameters of interest (avec $\mu_\omega < 0$, $\mu_A > 0$, $\mu_\theta > 0$)
- Each parameter to be estimated depends on *trade elasticity* – demand side - and *technology parameters* (supply side)
- const = $-\rho \times (\gamma^b + \delta^b)$ = *Border* effect

3. Data and Measurement

- Trade flows of food products within and across EU countries because...
  - the EU is a *free trade area* (no tariff, no bilateral agreement, mutual recognition)
  - the EU is composed of a large number of countries characterized by *heterogeneous labor and food markets* → large variations across countries in labor cost, productivity and product quality;
  - EUROSTAT reports aggregate indicators on food industry based on firms' accounting data at the *4-digit NACE level* (*k*=1… 32 food industries) for each EU member since 1997. → large variation across industries and over time
    - Production value ν_{jt}^{k}, *unit* labor cost ω_{jt}^{k},
    - labor, investment, capital → Global Factor Productivity A_{jt}^{k} ("Olley & Pakes" approach)

- Trade data: COMEXT database (32 food industries, 27 EU countries, 1997-2015
  - Trade value $\mathrm{M}_{ji,t}^{k}$ (and $\mathrm{M}_{ii,t}^{k} = \nu_{it}^{k} - \mathrm{export}_{i,t}^{k}$)
  - Volume & unit value → Using import demand equation ("Khandelwal" approach), we infer product quality $[\theta_{j}^{k}(v)]^{\beta_{i}^{k}}$ *This approach assigns higher qualities to varieties with higher demands conditional on prices*.

4. Results [GMM estimators]

Table 3: IV Estimates of Competitiveness Factors

Dependent variable: Ln relative imports - Ln relative output	(3)
Ln relative labor cost	-0.6834***
	(0.1029)
Ln relative TFP	0.1925*
	(0.1029)
Ln relative quality	0.4698***
	(0.0260)
Ln relative land/capita	0.2055
	(0.3190)
Common Euro currency	0.1279**
	(0.0515)
Common single market	0.7279***
	(0.0496)
Constant (Border)	-6.7125
	–
Gravity variables	No
Country-pair FE	Yes
Industry-Year FE	Yes
Exporter-industry FE	Yes
Importer-industry FE	Yes
Instruments	
Weak identification test (F-stat)	61.329
Hansen J-stat (p-value)	0.5531
Endogeneity test (p-value) Observations	87131

Hausman-type instruments using variation of the relative labor cost and productivity across industries within a country

5. Counterfactual Analyses

We quantify how French imports and demand for domestic products would react following a change in labor cost or in productivity or in perceived quality

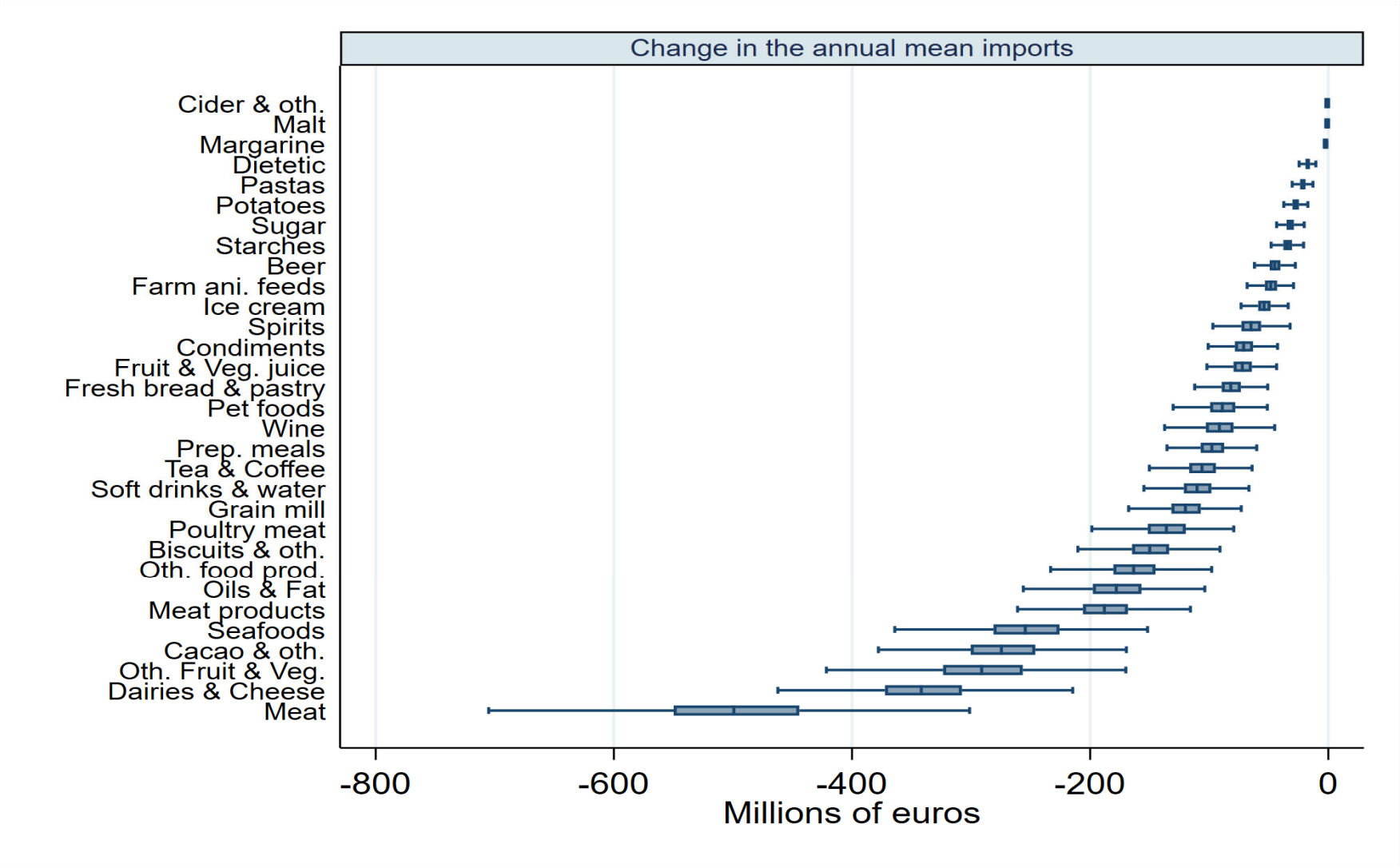
- For each industry, 3 scenarios:
  1- Labor cost in France reaches the minimum value of its main EU rivals (DE, BE, DK, ES, IE, IT, GB, NL) ↓ ~ 30%
  2- Productivity in France reaches the maximum value of its main EU rivals ↑ ~ 50%
  3- Quality of French products reaches the maximum value of its main EU rivals. ↑ ~ 25%

- We conduct Monte Carlo simulations - *We simulate the distribution of the point estimate of the competitiveness factor of interest (using 1000 draws).*
  - We compute the predicted ratio of imports $\tilde{\mathcal{R}}_{i,t}^{k}$ under each scenario → *partial* effect.
  - We infer the change in the consumption of domestic products $\tilde{\mathrm{M}}_{ii}^{k}$ (and total imports) in each scenario, assuming that France's expenditure E_i^k remains *constant*:

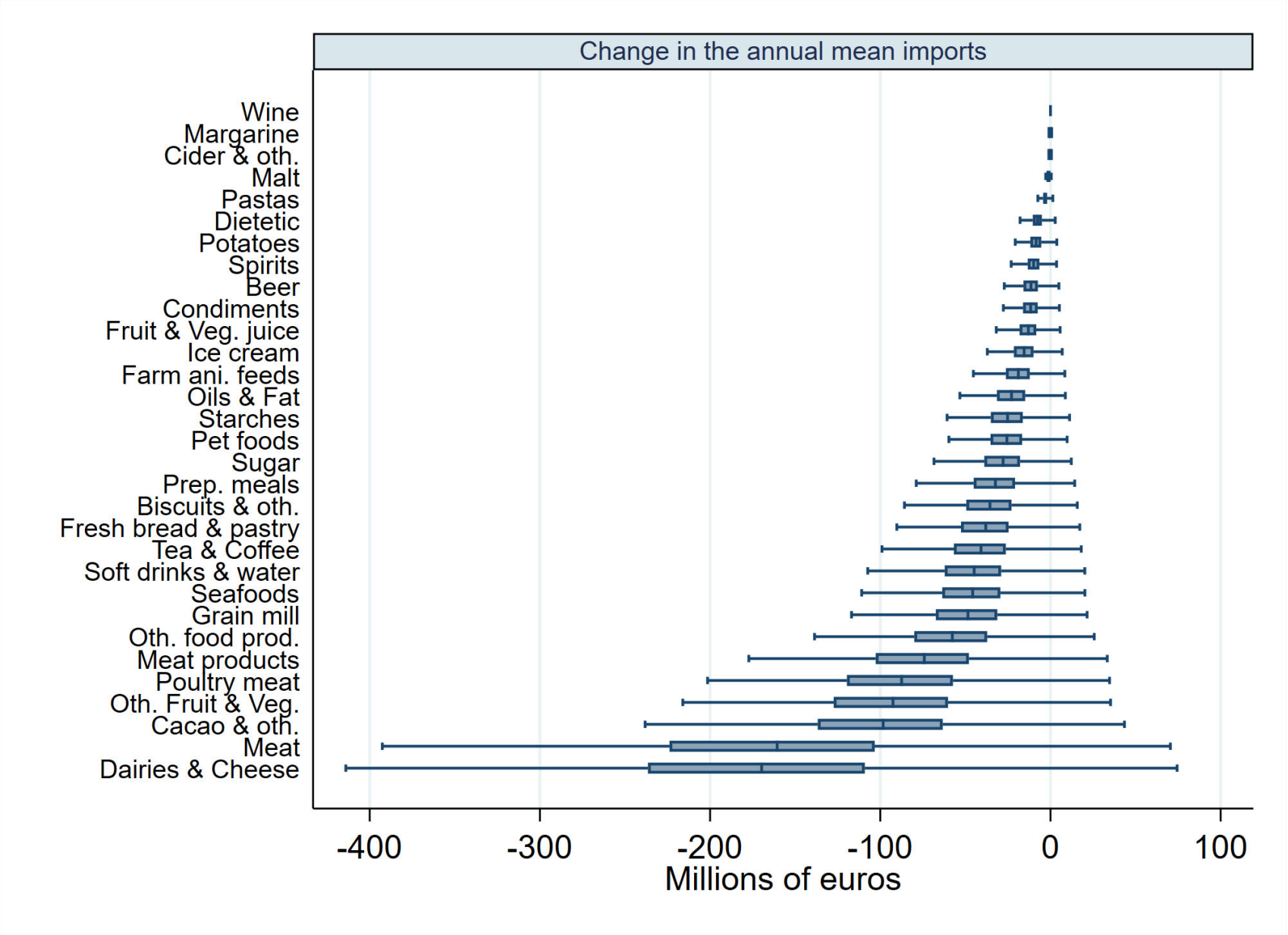
$$E_i^k = \mathrm{M}_{ii}^k + \sum_j \mathcal{R}_{ij}^k \mathrm{M}_{ii}^k = \tilde{\mathrm{M}}_{ii}^k + \sum_j \tilde{\mathcal{R}}_{ij}^k \tilde{\mathrm{M}}_{ii}^k$$

$$\Rightarrow \tilde{\mathrm{M}}_{ii}^k - \mathrm{M}_{ii}^k = \left(\frac{1 + \Sigma_j \mathcal{R}_{ij}^k}{1 + \Sigma_j \tilde{\mathcal{R}}_{ij}^k} - 1 \right) \mathrm{M}_{ii}^k$$

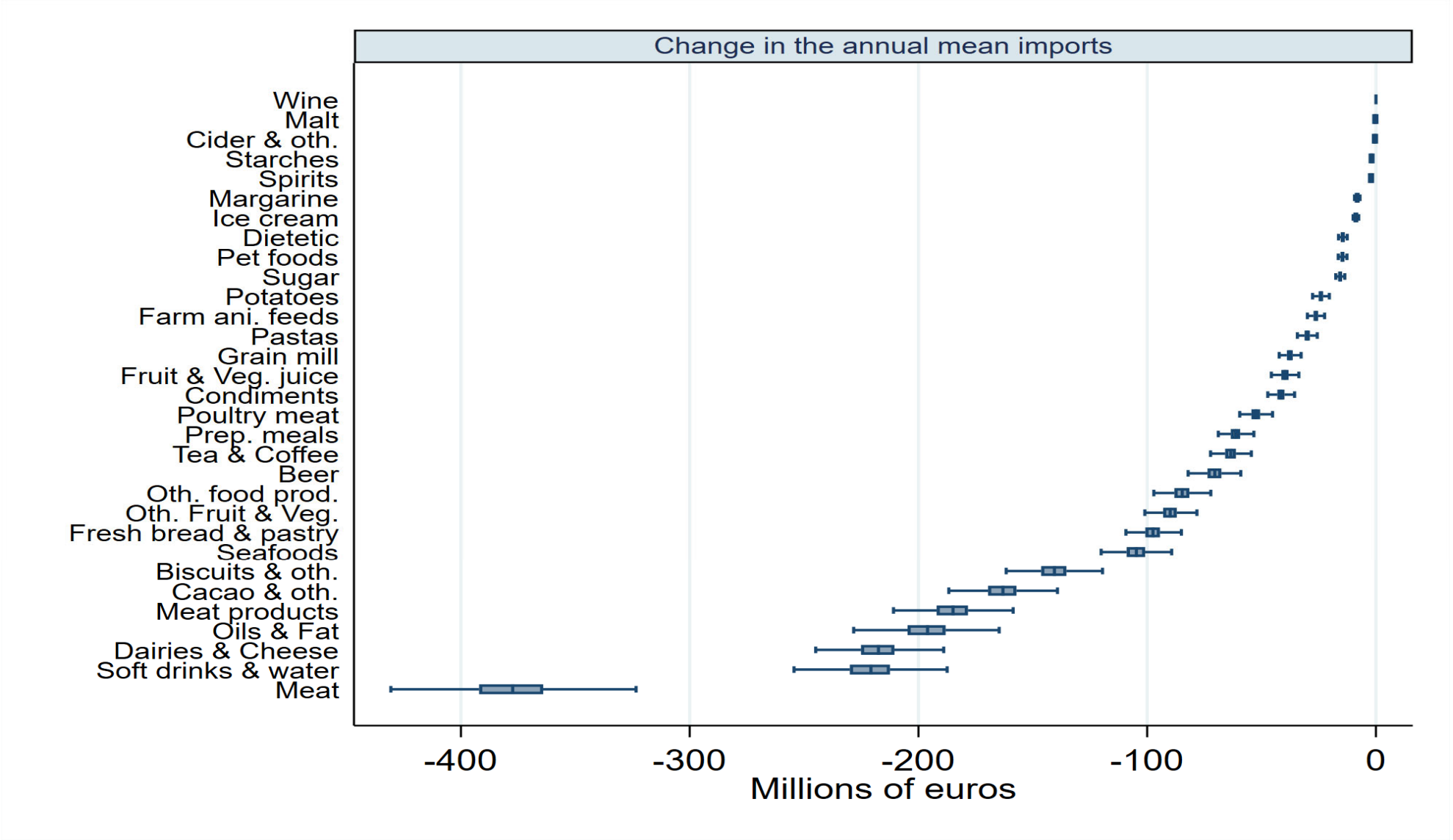
Scenario 1- Labor cost in France reaches the minimum value of its main EU rivals



Scenario 2 - The productivity in France reaches the maximum value of its main EU rivals



Scenario 3 – Product quality of French products reaches the maximum value of its main EU rivals



6. Conclusion and Discussion

- A new approach to measure the effects of price and non-price competitiveness on import competition based on a gravity framework and publicly available data.

- Our results highlight the importance of product quality (and also labor cost) to explain the differences observed across EU countries

- However, the magnitude of effects (*ceteris paribus*) is not high

  and we do not account for relationship between *wage*, *productivity*, and *product quality*

- Our results also point out the role of border effect in shaping trade flows and its relative importance regarding other competitiveness factors.

  Our measure of the border effect accounts for tastes, information-related costs, distribution costs, trust

- Extensions:
  - Other variables: price of inputs & markups