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Estimating Food Quality from Trade Data: An Empirical Assessment

D. Curzi and L. Pacca
Department of Economics Management and Quantitative Methods
University of Milan

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Research objective

- To test the properties and the reliability of some recent methods developed to measure the quality of the exported food products
  - ✓ Methods used: **Khandelwal** (2010) and **Khandelwal, Schott and Wei** (2013)
    - *«Higher quality is assigned to product with higher market share, conditional on price»*
- To analyze the evolution of our quality measure in comparison with the one of unit value
  - ✓ To test the correlation price-quality
  - ✓ To analyze countries' export strategies → **Price vs. Quality** competition strategies

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Outline

- ***Motivations***
- Data
- Quality estimations
- Empirical strategy
- Results
- Conclusions

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Motivations

Why do we focus on quality?

- Exports' quality has a fundamental role both in driving the direction of trade, and in determining the countries' (firms) trade performances
  - ✓ Richer countries tend to import more from countries producing higher-quality goods (Linder, 1961; Hallak, 2010; Crinò and Epifani, 2012; Curzi and Olper, 2012)
    - Particularly important for developing countries who want to export to richer countries
  - ✓ Product quality is considered one of the most important elements that allows firms to have success in the international markets (Sutton, 2007; Helpman, 2011)
    - Often viewed as a pre-condition for export success (Grossman and Helpman, 1991; Amiti and Khandelwal, 2013)

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Motivations

However, quality is **unobservable!**

- Commonly proxied using **price** (unit value) from trade data
  - ✓ Although widely used, price is an imprecise measure of quality
    - Higher price could reflect higher quality but also higher costs (Aiginger, 1997)
    - Higher unit values could also be the consequence of higher margins created by market power (Knetter, 1997)
- Some recent papers tried to purge all the elements above in order to obtain a more reliable proxy for quality (Hallak and Schott, 2011; Khandelwal, 2010; Khandelwal, Schott and Wei, 2013)
  - ✓ Countries selling large quantities of physical output, conditional on price, are classified as high quality producers

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Motivation

We measure quality at the country-product level, for food products exported over the period 1995-2007

Methods used:

- Nested logit demand function by **Khandelwal (2010)**
- CES demand function by **Khandelwal, Schott and Wei (2013)**
  - ✓ Although the two methods are conceptually similar, our preferred measure is the one of Khandelwal (2010)
    - Nested logit demand approach allows for a more reliable substitution pattern, by placing varieties into appropriate nests
  - ✓ However, the Khandelwal, Schott and Wei (2013) method…
    - …allows the use of FOB prices instead of CIF
    - …offers the possibility to decompose FOB price in its quality and price-adjusted-quality components

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Data

Quality estimation – Khandelwal (2010)

- Trade data from Eurostat Comext: Imports data to EU15 at 8-digit level, for the period 1995-2007
- Production data from Eurostat Prodcom NACE REV 1.1: for the market share estimates in the 14 importing countries
- Feenstra et al. (2002); CEPII, World Bank, Brent Oil: transportation costs; distance, population, oil price.

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Data

Quality estimation – Khandelwal, Schott and Wei (2013)

- Bilateral FOB prices and export quantity at the HS 6-digit level from BACI database (CEPII) for all the world trading countries (not only EU 15), over the period 1995-2007
- Elasticities of substitution from Broda, Greenfield and Weinstein (2006), at the HS 3-digit level.

Other data

- WITS-World Bank: Data on import tariff at country-product (HS6-digit) level in the period 1995-2007
- Data on labour productivity and capital from UNIDO database → for estimating TFP

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Quality estimation (1)

Khandelwal (2010)

'conditional on price, imports with higher market shares are assigned higher quality'

- Quality of product *h*, exported by country *c*, is estimated using the *nested logit* demand function (Berry, 1994):

Market Share

$$\ln(s_{cht}) - \ln(s_{0t}) = \phi_{1,ch} + \phi_{2,t} + \alpha p_{cht} + \sigma \ln(ns_{cht}) + \gamma \ln pop_{ct} + \phi_{3,cht}$$

$$\boldsymbol{Quality} \equiv \phi_{cht} = \hat{\phi}_{1,ch} + \hat{\phi}_{2,t} + \hat{\phi}_{3,cht}$$

- Estimation methods: OLS and 2SLS
- The demand function is estimated **separately** for each **EU 15** importer country – NACE 4-digit

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Data

Industries and products for the quality estimations

NACE 4	Short description	#CN8	Mean Ladder
(1)	(2)	(3)	(4)
1511	Production and preserving of meat	142	3.54
1512	Production and preserving of poultry meat	196	3.05
1513	Production of meat and poultry meat products	108	3.11
1520	Production and preserving of fish and fish products	401	1.42
1530	Production and preserving of fruit and vegetables	495	2.77
1540	Manifacture of vegetables and animal oils and fats	144	1.60
1550	Manifacture of diary products	204	2.02
1560	Manifacture of grain mill products, starches and starch products	178	1.85
1580	Sugar and cocoa	60	1.70
1581	Manifacture of bread; manifacture of fresh pastry goods and cakes	2	0.59
1582	Manifacture of rusked and biscuits	29	1.47
1585	Manifacture of maccaroni, noodles and couscous	11	2.15
1586	Processing of tea and coffee	22	2.05
1587	Manifacture of condiments and seasoning	11	2.37
1588	Manifacture of omogenized food preparaison and dietetic food	7	1.93
1589	Manifacture of other food products n.e.c.	37	2.76
1590	Production of ethyl alcohol, cider, malt and other non-distilled fermented beverages	18	2.90
1591	Manifacture of distilled potable alcoholic beverages	67	4.78
1593	Manifacture of wine	99	3.44
1596	Manifacture of beer	4	0.86
1598	Production of mineral water and soft drinks	11	1.45

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Quality estimation (2)

Khandelwal, Schott and Wei (2013)

'conditional on price, a variety with a higher quantity is assigned higher quality'

- Quality of product *h*, exported by country *c*, is estimated using the following CES demand function:

$$\ln q_{cht} + \sigma \ln p_{cht} = \alpha_h + \alpha_{ct} + e_{cht}$$

$$quality = \hat{\phi}_{cht} \equiv \hat{e}_{cht}/(\sigma - 1)$$

- Estimation method: OLS
- The demand function is estimated **separately** for each **World** importer country – NACE 4-digit

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Empirical strategy

1. **Testing the reliability of our quality measure**
   - ✓ Quality rankings in representative food sectors
   - ✓ Correlation Quality vs. TFP growth
2. **Comparing quality vs. price (unit value) evolution**
   - ✓ Correlation Quality vs. Price growth in countries with different level of development and in representative food sectors
3. **Testing the relationship between price, quality and trade costs (i.e. distance and ad valorem tariffs)**
   - ✓ By decomposing export FOB price in its quality and price-adjusted-quality components

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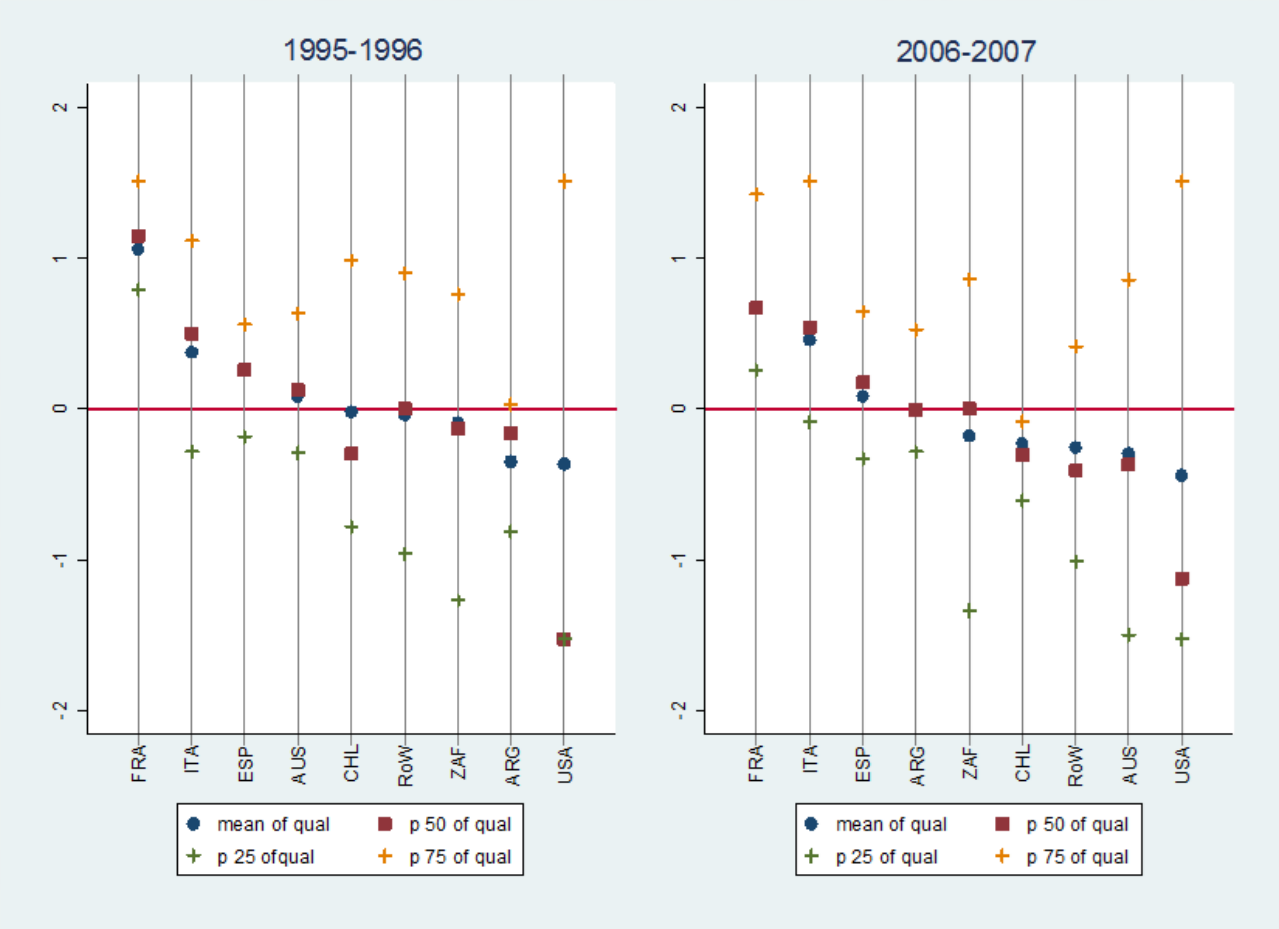
Results

Quality ranking on “quality white wine” (CN8 code 22042111)



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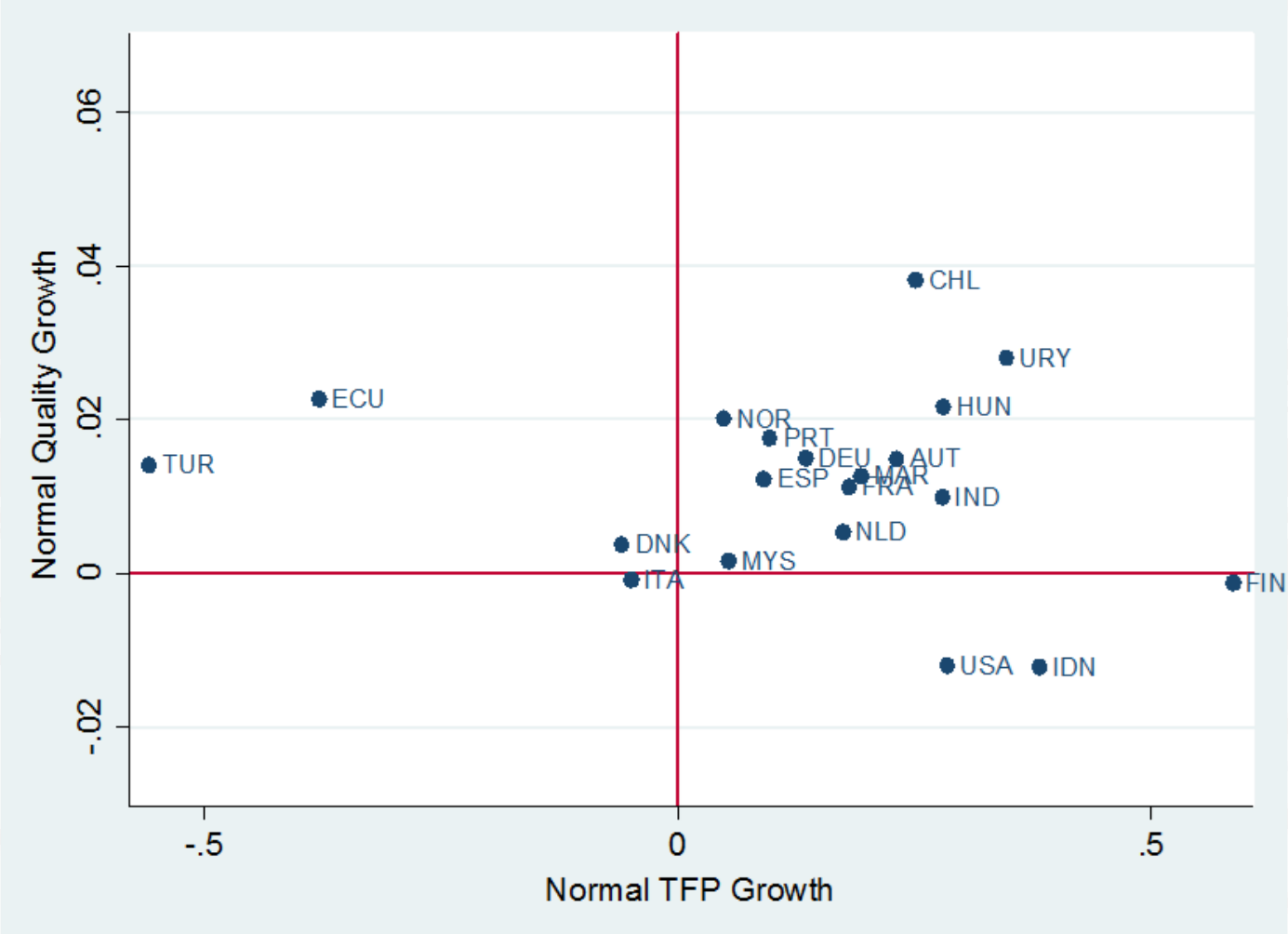
Main Results

Quality and TFP growth (2000-2007)



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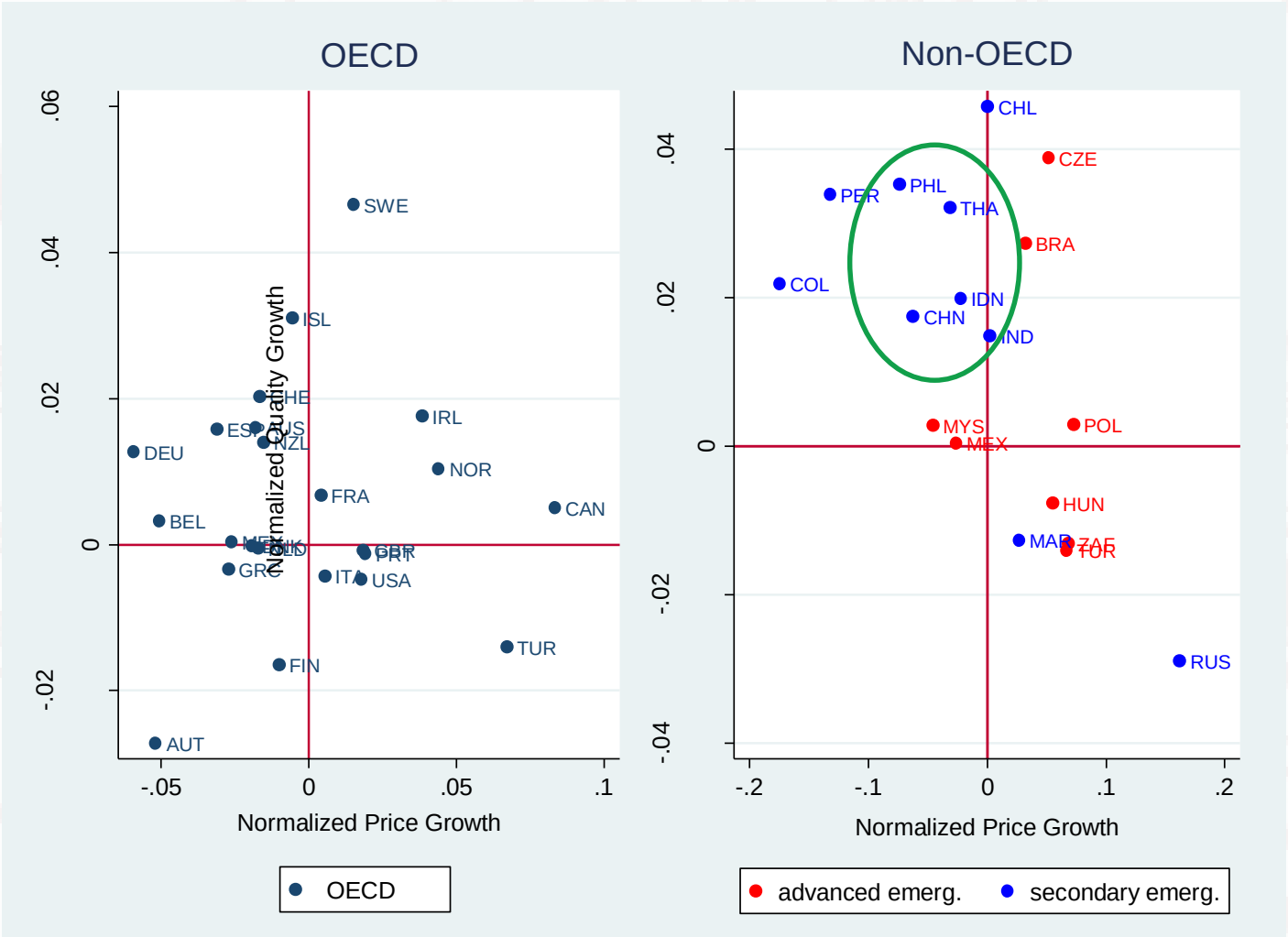
Main Results

Change in Quality vs Price OECD and non-OECD Countries (1995-2007)



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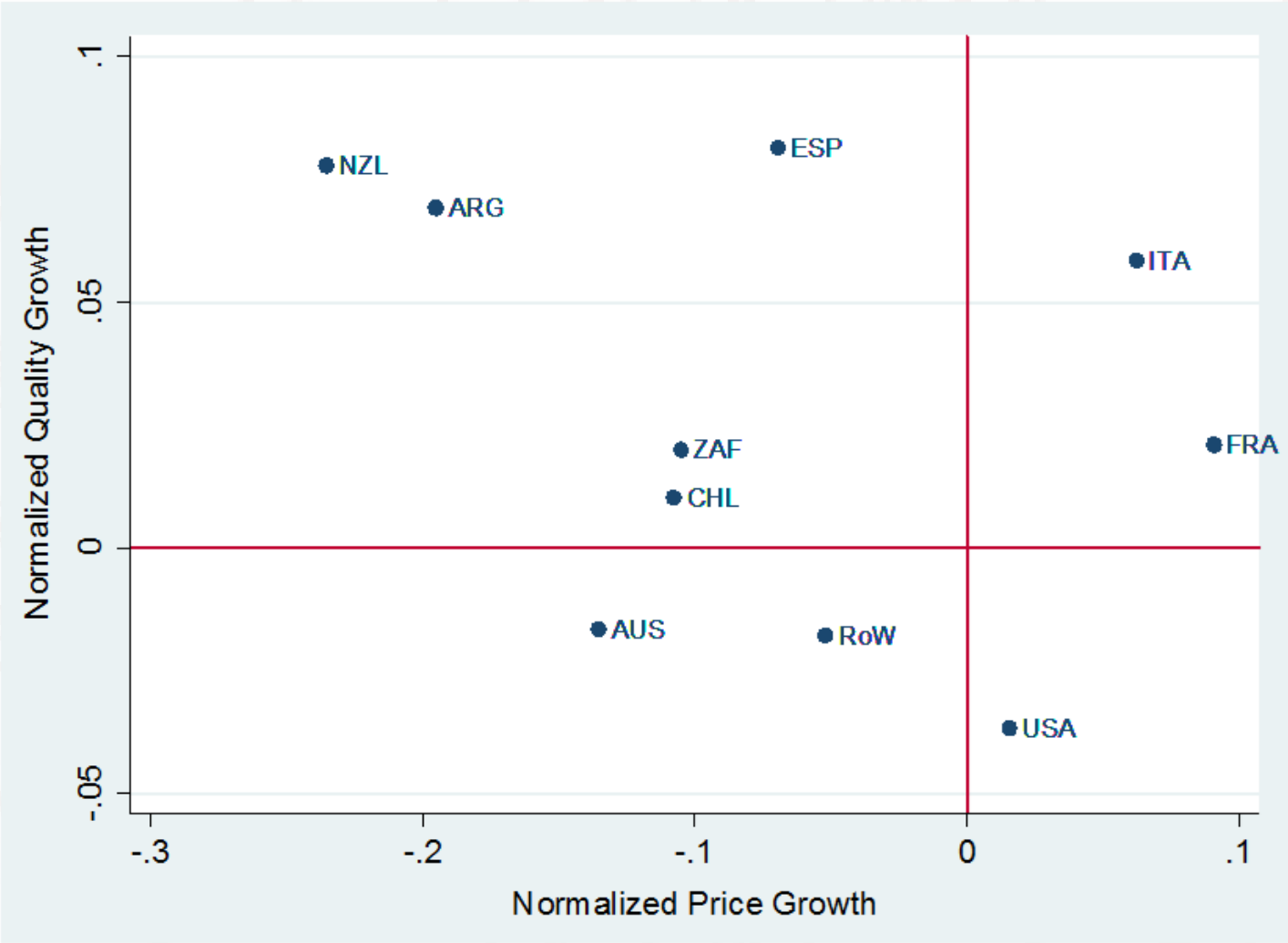
Main Results

Change in Quality vs Price – Wine Sector (1995-2007)



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Main Results

Price, quality and trade costs

	(1) (ln) Price	(2) (ln) Quality	(3) Price Adj. Quality
(ln) Tariff	-0.00297***	-0.00317***	0.000196
	(0.000752)	(0.000729)	(0.000878)
(ln) Distance	0.0692***	-0.00943***	0.0786***
	(0.000718)	(0.000676)	(0.000811)
Exporter FE	YES	YES	YES
Importer FE	YES	YES	YES
Product FE	YES	YES	YES
Year FE	YES	YES	YES
N	1,541,020	1,541,020	1,541,020

Significance levels: * 0.10 **0.05 *** 0.01.

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Conclusions

- Our analysis finds evidence for the reliability of the Khandelwal (2010) approach
  - ✓ The quality rankings we draw for some representative food products are in line with the quality perceived by the public
  - ✓ Positive correlation between Quality growth and TFP growth
- Quality upgrading is often poorly correlated with price variation
  - ✓ An increase in quality does not always correspond to a growth in prices, especially for developing and emerging countries
- Pure price and quality components of FOB prices explain different trade costs
- **The use of price as proxy for quality may lead to a misinterpretation of the results**

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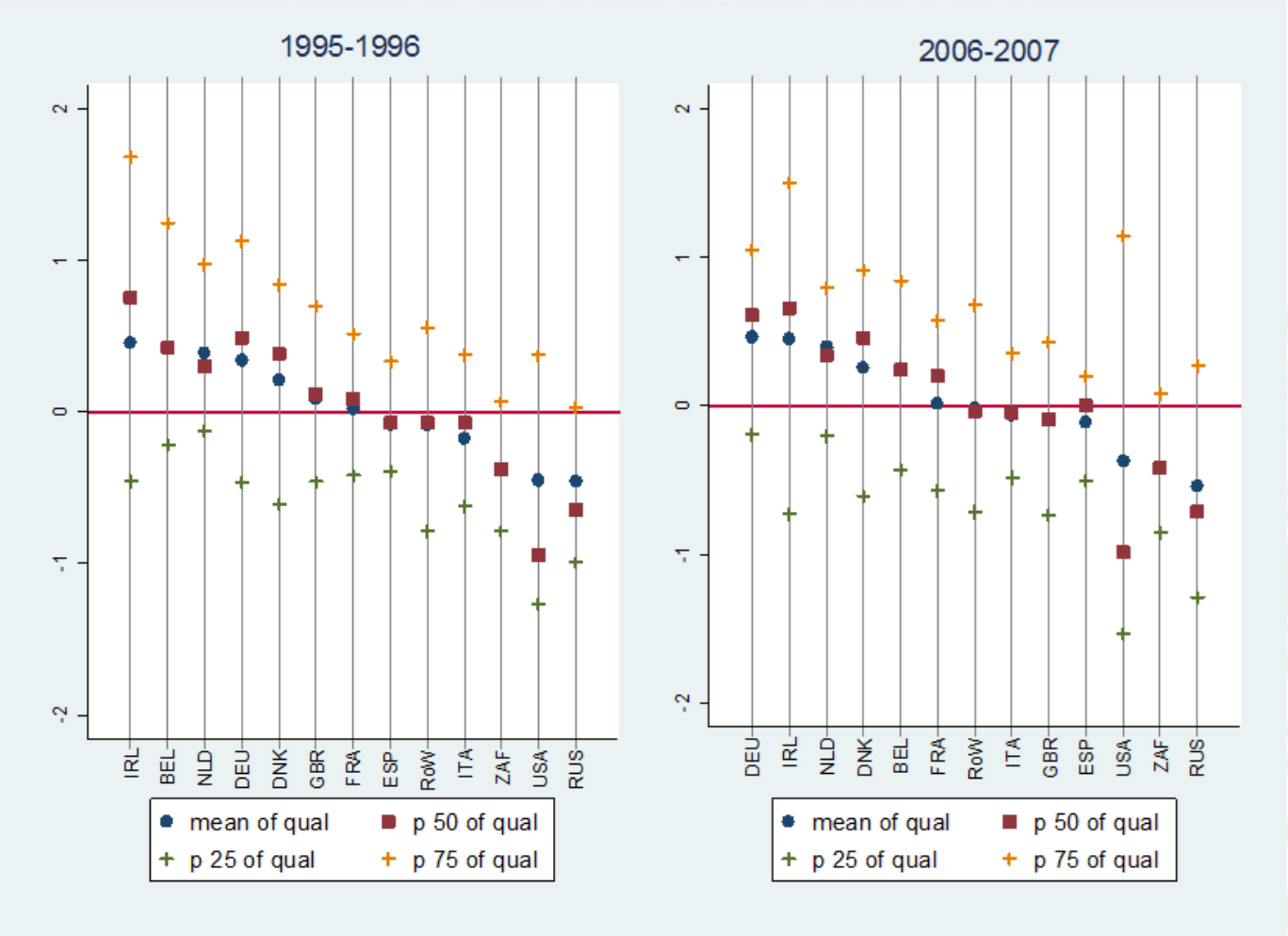
THANK YOU

Results

Quality ranking on “beer” (CN8 code 22030001)



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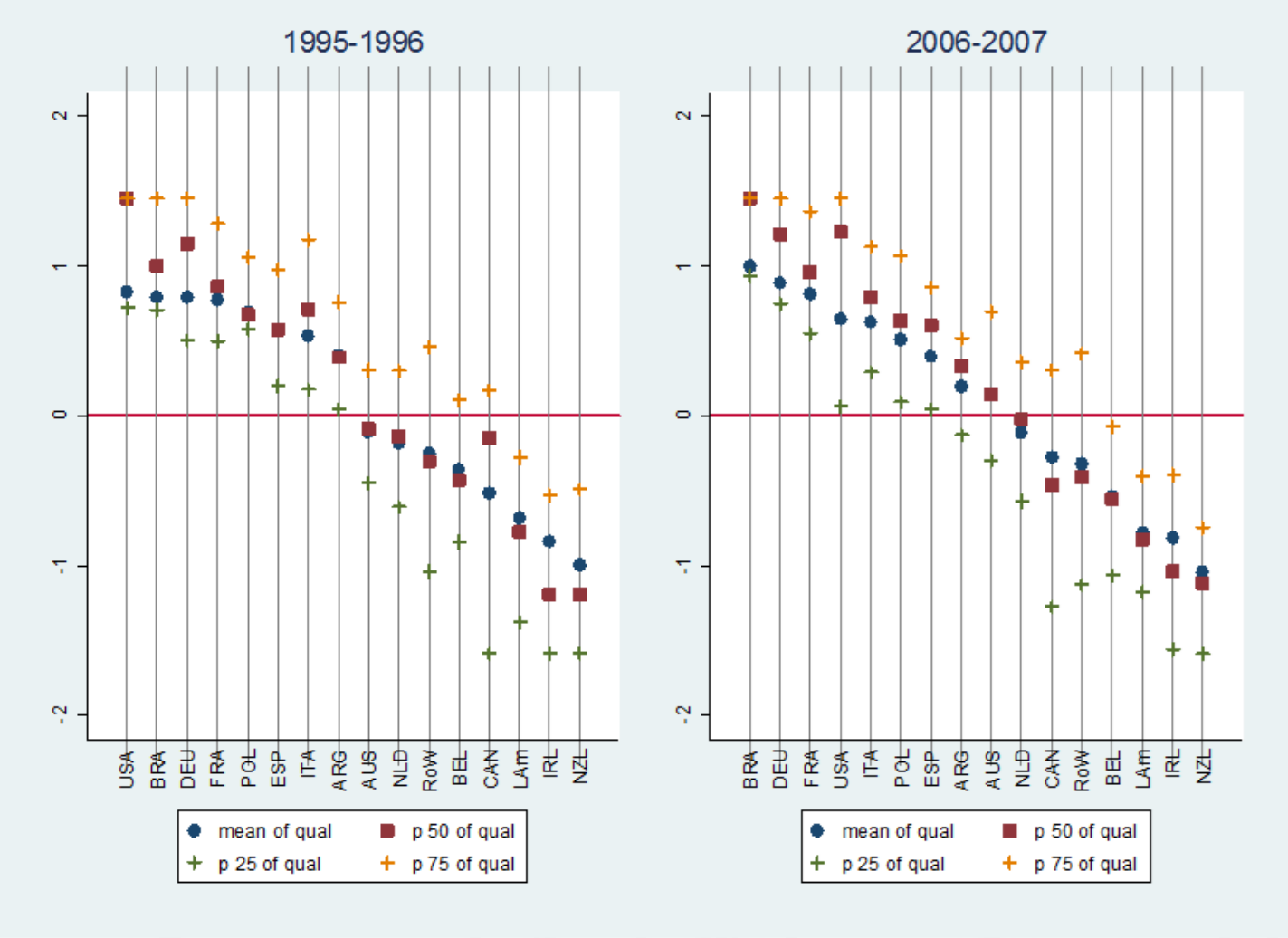
Results

Quality ranking on “fresh bovine meat” (CN-8 code 02011000)



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