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Consumer Behavior in Tourism Symposium – 2013

ESTIMATING THE CARBON FOOTPRINT OF TOURISM IN SOUTH TYROL

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Overview

- Aim:
  - Quantify the greenhouse gas (GHG) emissions associated with tourism in South Tyrol (ST)

- Methodological approach:
  - Input-Output (IO) analysis
  - Multi-regional model

South Tyrol and tourism

Population ≈ 505,000

Origin	Visitors (mln, 2008)	Nights (mln, 2008)
South Tyrol	1.4	0.6
Other	8.2	32.1
Total	**9.6**	**32.6**

The contribution of tourism to South Tyrol's economy

	Direct	Direct and indirect
Value added (% of total)	1,731 mln € (11.2%)	1,903 mln € (12.4%)
Employment (% of total)	–	41,300 FTE (15.3%)

Source of data: ASTAT (2012). Impatto economico del turismo. Astat Info nr. 15.

The carbon footprint of tourism

- ‘Unfortunately, there has been little attempt to measure CO_2 emissions associated with individual tourism destinations’(Dwyer et al. 2010)

- Some notable exceptions:
  - Jones and Munday (2007), Wales
  - Dwyer et al. (2010), Australia
  - Whittlesea and Owen (2012), South West England

Carbon footprints and IO models

- The use of IO models to analyze carbon footprints is well established
  - Hendrickson et al. (2006)
  - Minx et al. (2009)
- Applications to tourism using multiregional IO at a very local level?

Main practical difficulties

- No ‘tourism industry’ in official statistics.
- Very limited data availability at the subnational level.

Outline of presentation

- Model structure and data requirements
- Preliminary results
  - the estimated carbon footprint of tourism in ST
- Concluding remarks
  - (Current) limitations, ongoing work, potential extensions

STRUCTURE AND DATA REQUIREMENTS OF THE MODEL

IO modeling and carbon footprints

Money spent by tourists on different products in ST

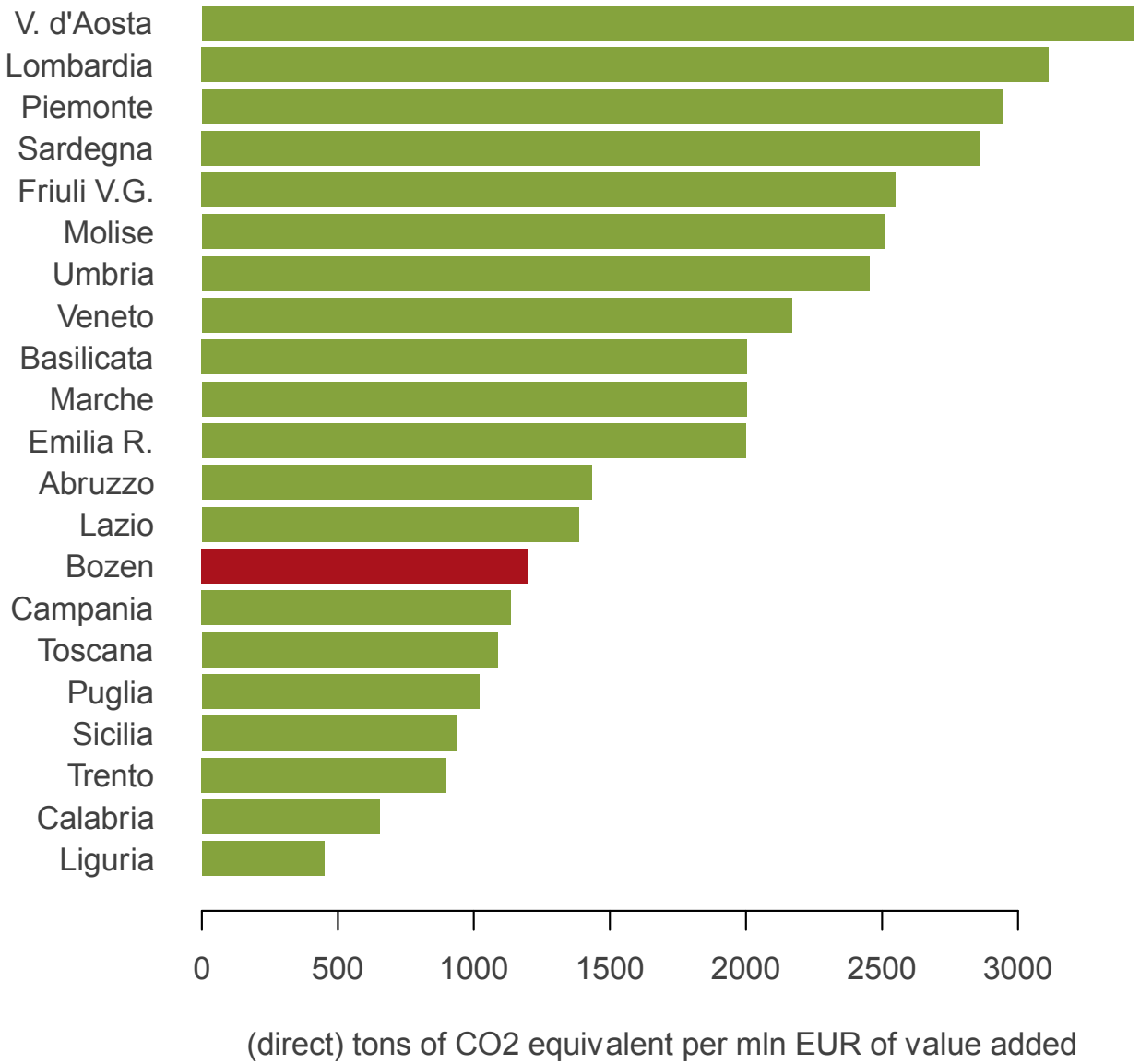
Multi-regional IO model

Estimates of GHG emission (direct and indirect)

- 59 industries (NACE rev. 1.1)
- 5 regions

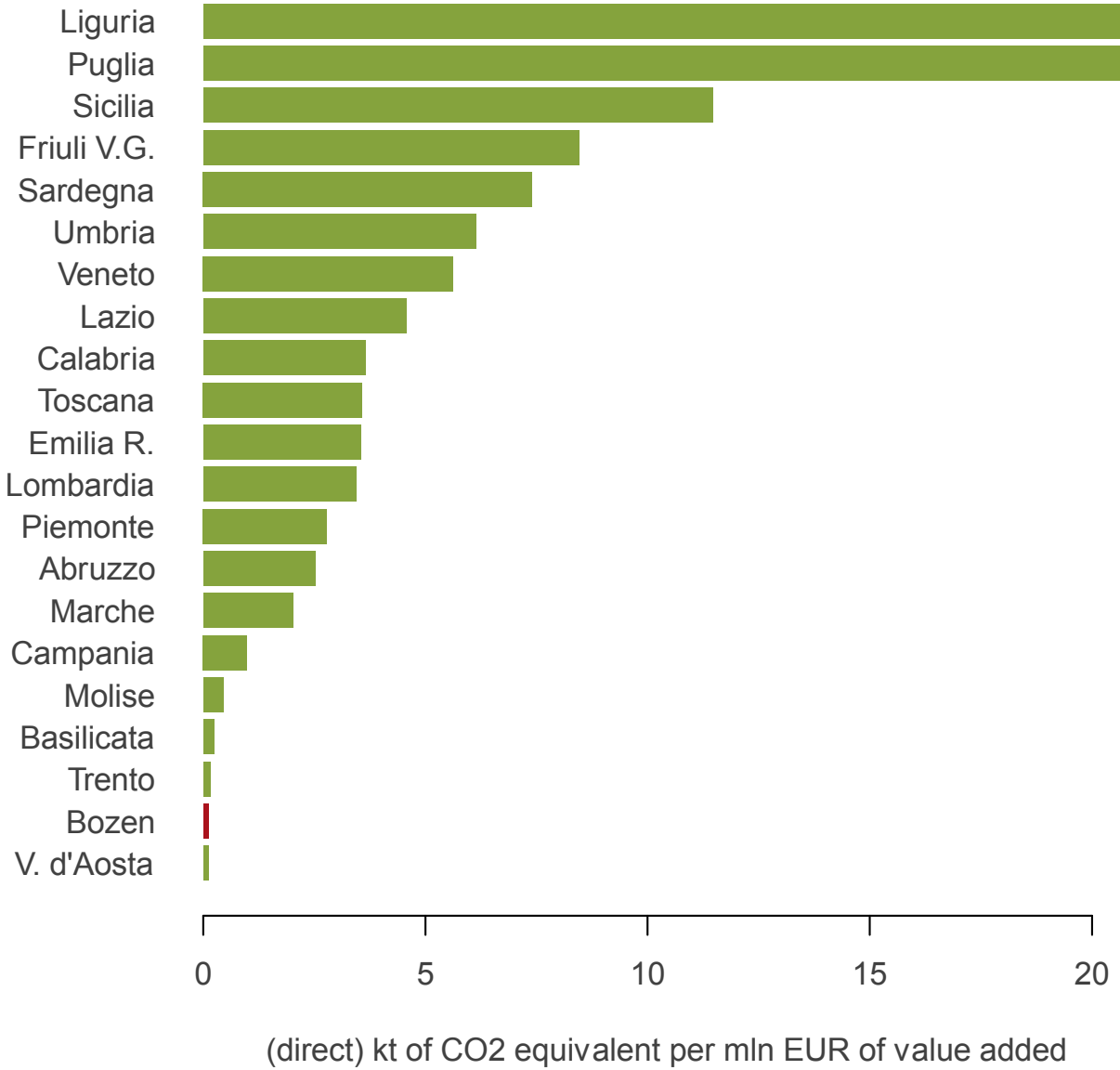
Why multiple regions?

Emission factors of agriculture in Italy, 2005



Source of data: ISTAT (2009) NAMEA: emissioni atmosferiche regionali

Emission factors of energy production in Italy, 2005



Source of data: ISTAT (2009) NAMEA: emissioni atmosferiche regionali

Regions of the model

South Tyrol

Northwest

Northeast

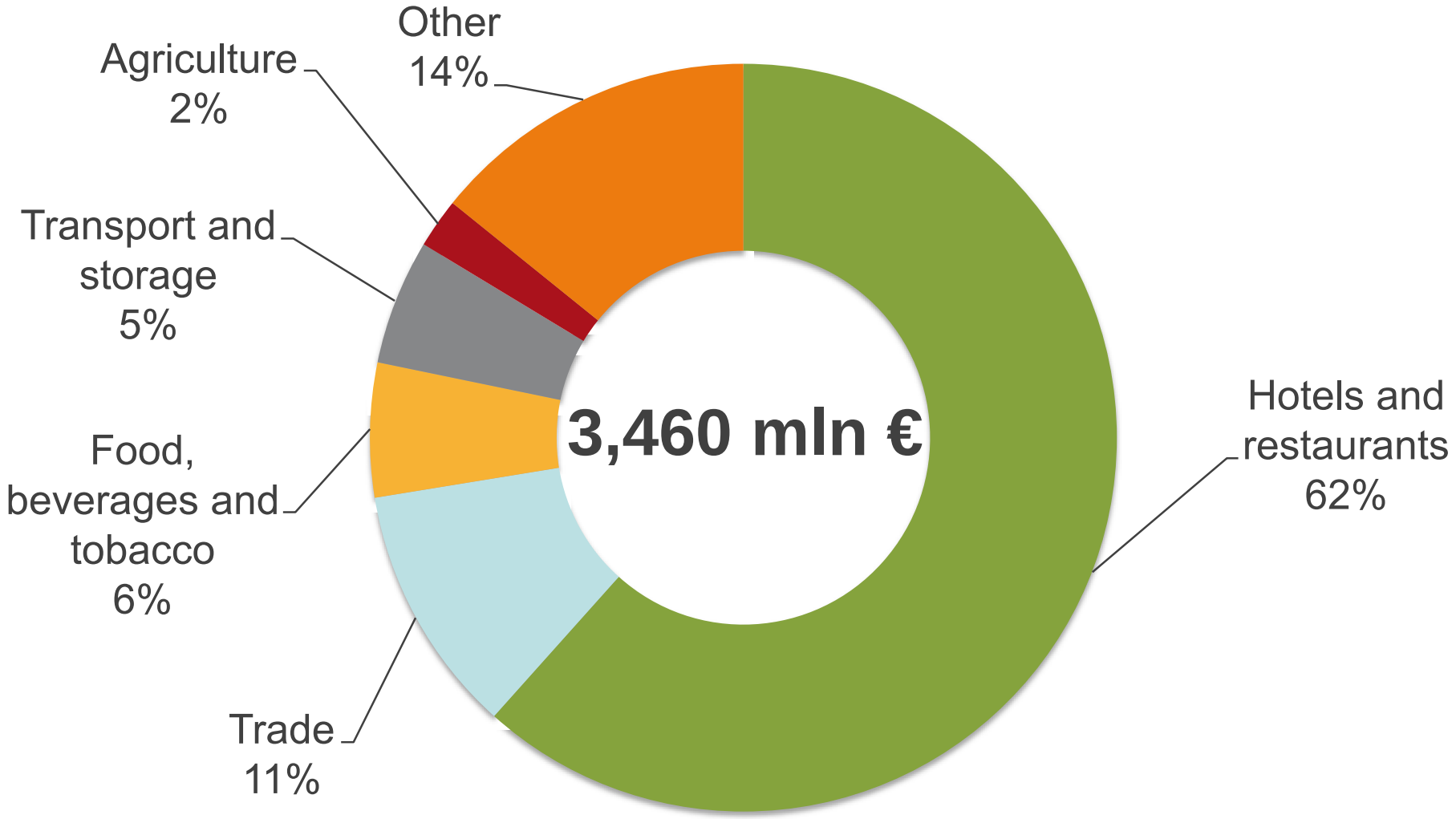
+ REST OF WORLD

Rest of country

Data requirements of the model

1. Final demand by tourists by industry
2. Interregional matrix of input coefficients
3. Regional emission factors by industry
4. Rest of the world region

1. Tourism demand by industry, 2010



Source of data: ASTAT (2013), Tavola Input-Output per lAlto Adige 2010. Astat info nr. 70.

2. Interregional input coefficients

- Input coefficients estimated as:

Product i from region r needed to produce one unit of product j in region s

i needed per unit of j in Italy (from national IO table)

$$a_{ij}^{rs} = c_i^{rs} \times a_{ij}^{IT}$$

Share of all i used in s that comes from r (Laboriously estimated from Bank of Italy industry survey data)

3. Emission factors

- 2005 emission data at regional level from ISTAT
  - carbon dioxide (CO_2)
  - methane (CH_4)
  - nitrous oxide (N_2O).
- ‘Updated’ to 2008 (base year of the model)

4. The rest of the world

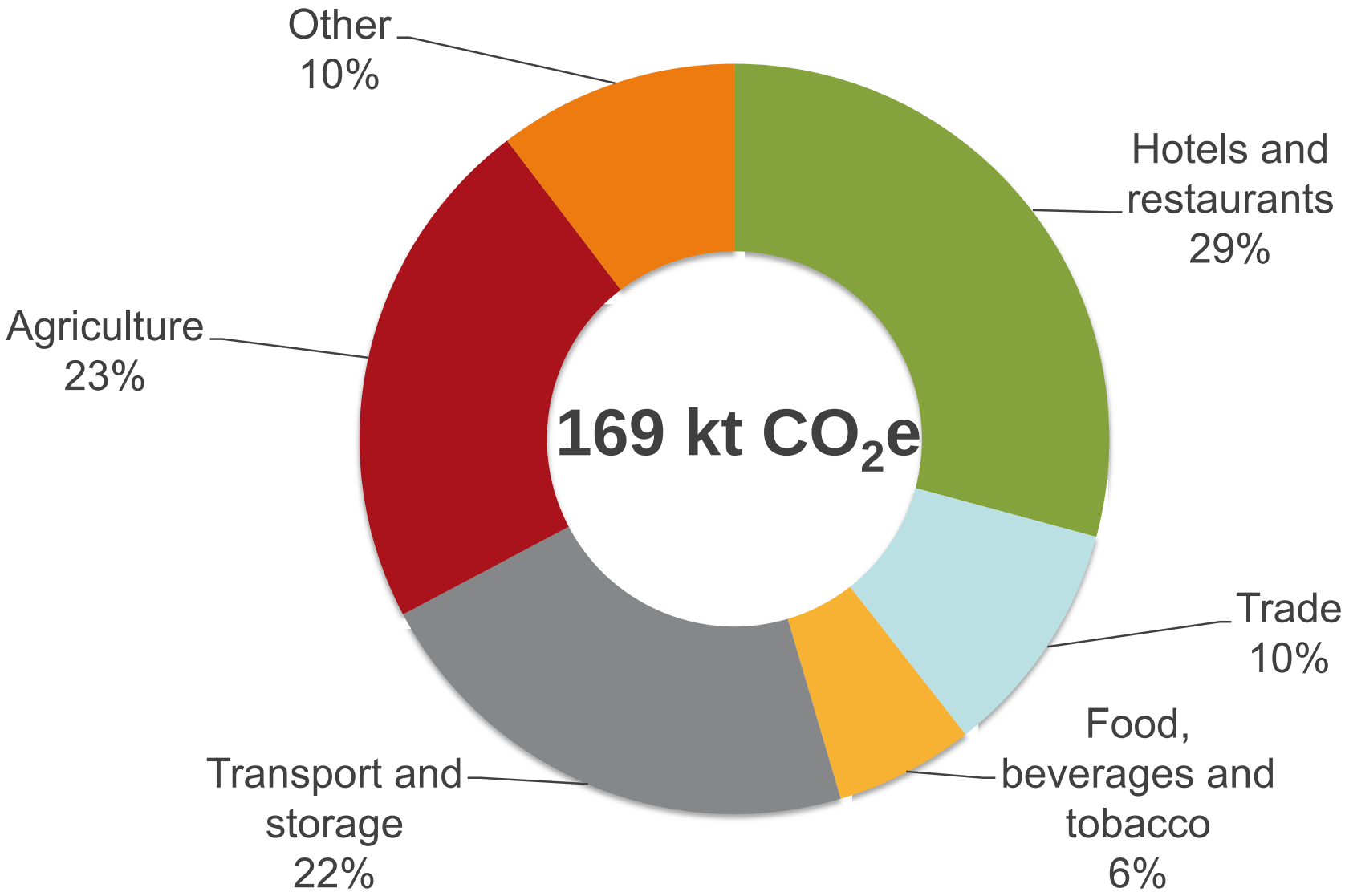
- Assumed German technology and emission factors (WIOD data)
- Working on improved representation
  - more foreign regions in the model

PRELIMINARY RESULTS

Direct emissions of ST's tourism

	Tourism (2010, modeled)	All productive activities (2005, ISTAT)
Direct emissions (kt CO_2e)	**169**	**1,892**

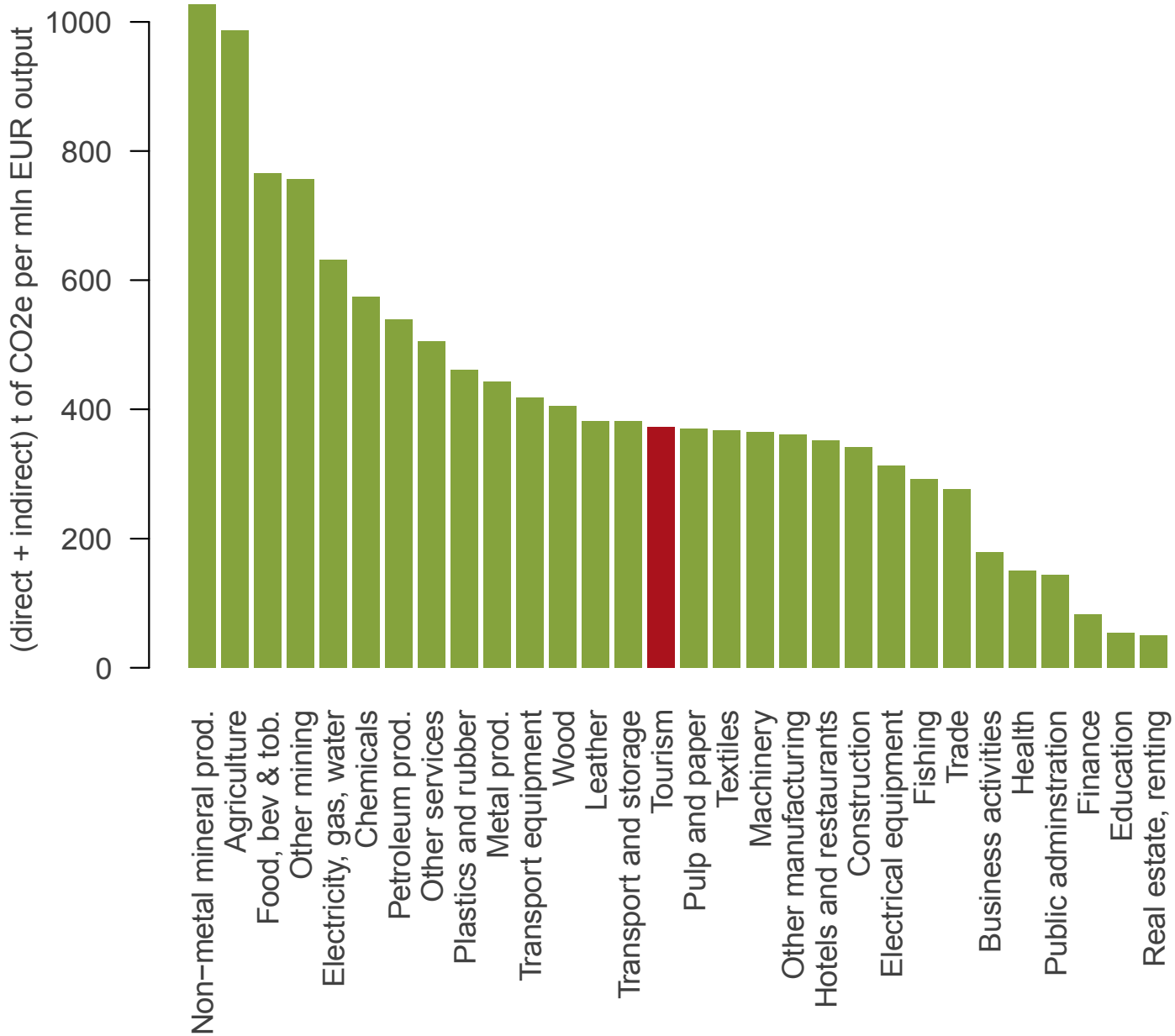
Direct emissions by industry



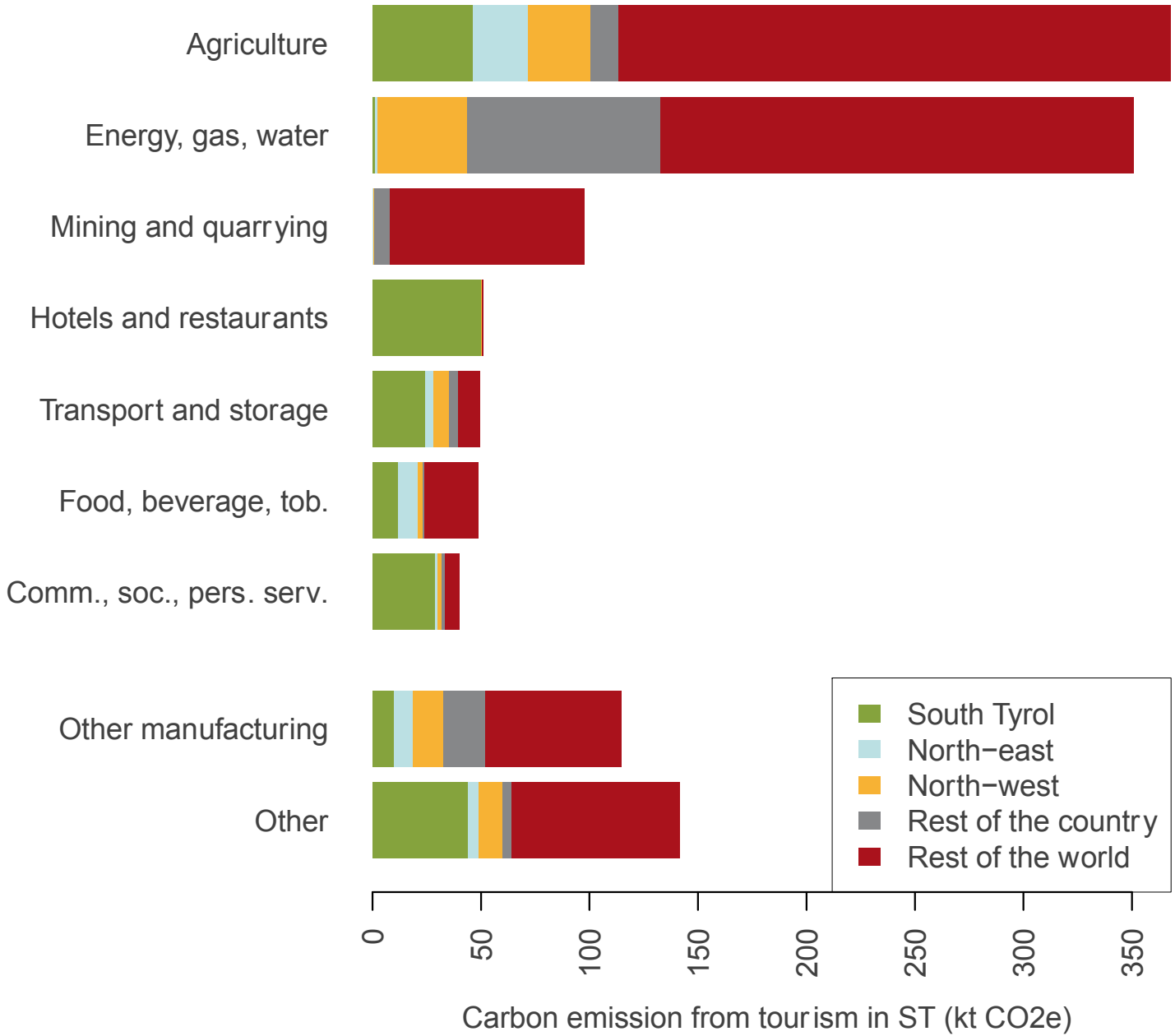
Direct and indirect emissions of ST's tourism

	Tourism (2010, modeled)
Total emissions (% direct)	**1,262 kt CO_2e** (13.4%)
Carbon intensity	**372 t CO_2e/mln €** of output
Emissions per visitor*	131.8 kg/visitor
Emissions per night*	38.7 kg/night

Carbon intensity of ST's industries



Carbon emissions of ST's tourism by industry and region



CONCLUDING REMARKS

Some issues with the current version of the model

- Overestimating import dependence of South Tyrol?
- Results sensitive to choice of rest of the world technology
- Treatment of emissions from transport

Potential extensions (subject to data availability)

- Include other environmental externalities
- Carbon footprint of more narrowly defined products or types of tourism
- Easy to replicate in other parts of the countrys

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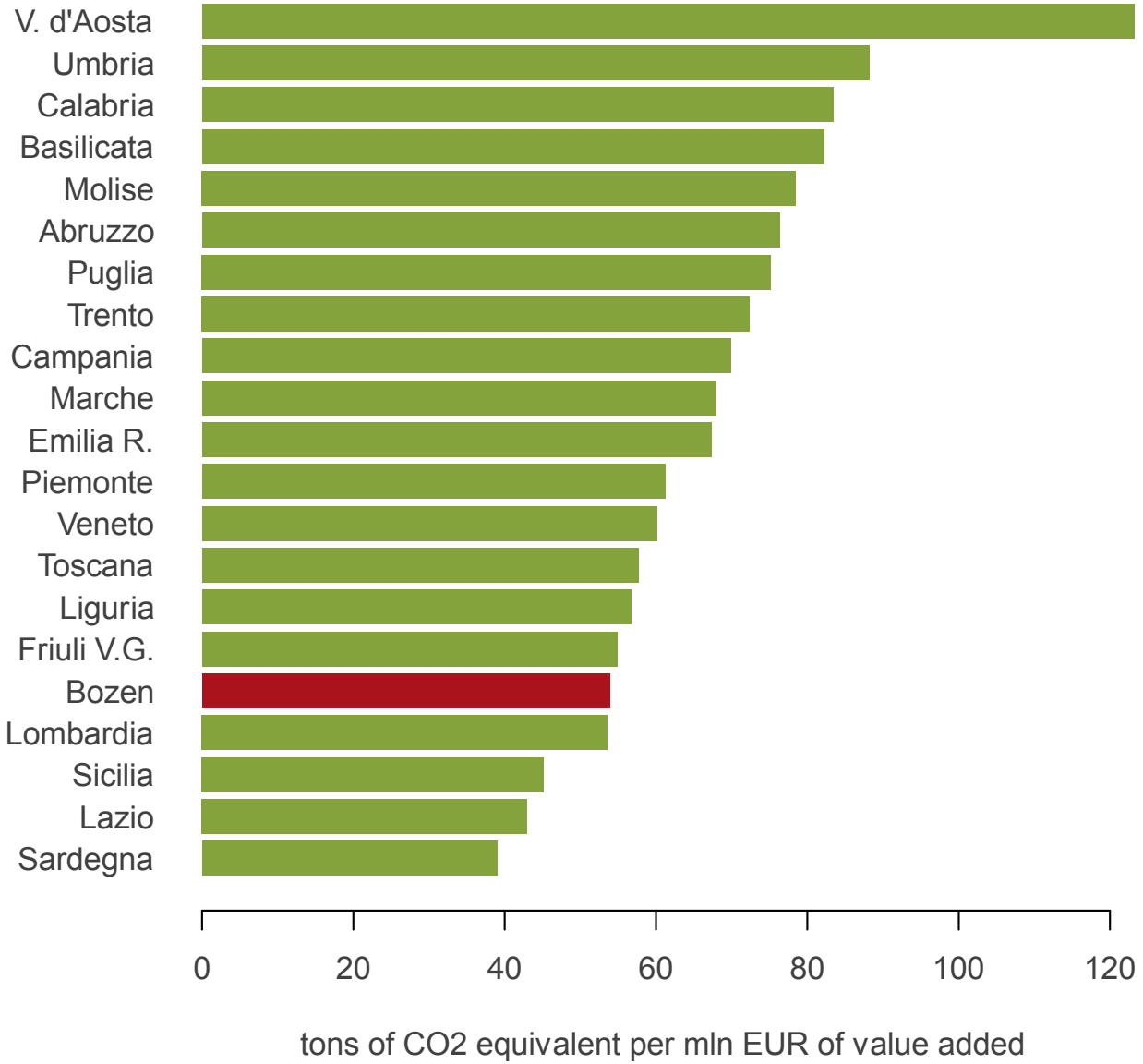
Familiar limitations of IO models

- Linearity
- Fixed interregional trade patterns
- Underlying data quality issues

Emission factors of hotels and restaurants in Italy, 2005



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