The Ecology of Scale: Data Assessment of Beef, Pork and Wine

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Objectives:

- Researching energy data for entire process chains of food;
- Allocating these data to adequate functional units;
- Comparing regional to global food, in terms of energy;
- Comparing small to large scale business, in terms of energy.

Why?

- Lack of empiric data and
- Many prejudices regarding global and regional food.

Method: Qualitative, performing case studies!

1. Researching all the energy efforts such as gas, fuels, power:

- of producing food including farming, breed and crop;
- of transporting and distributing from the place of origin via any processing unit up to the point of sale.

2. Allocation of these primary data to the functional units;

3. Specific turnover of energy versus business size.

Who?

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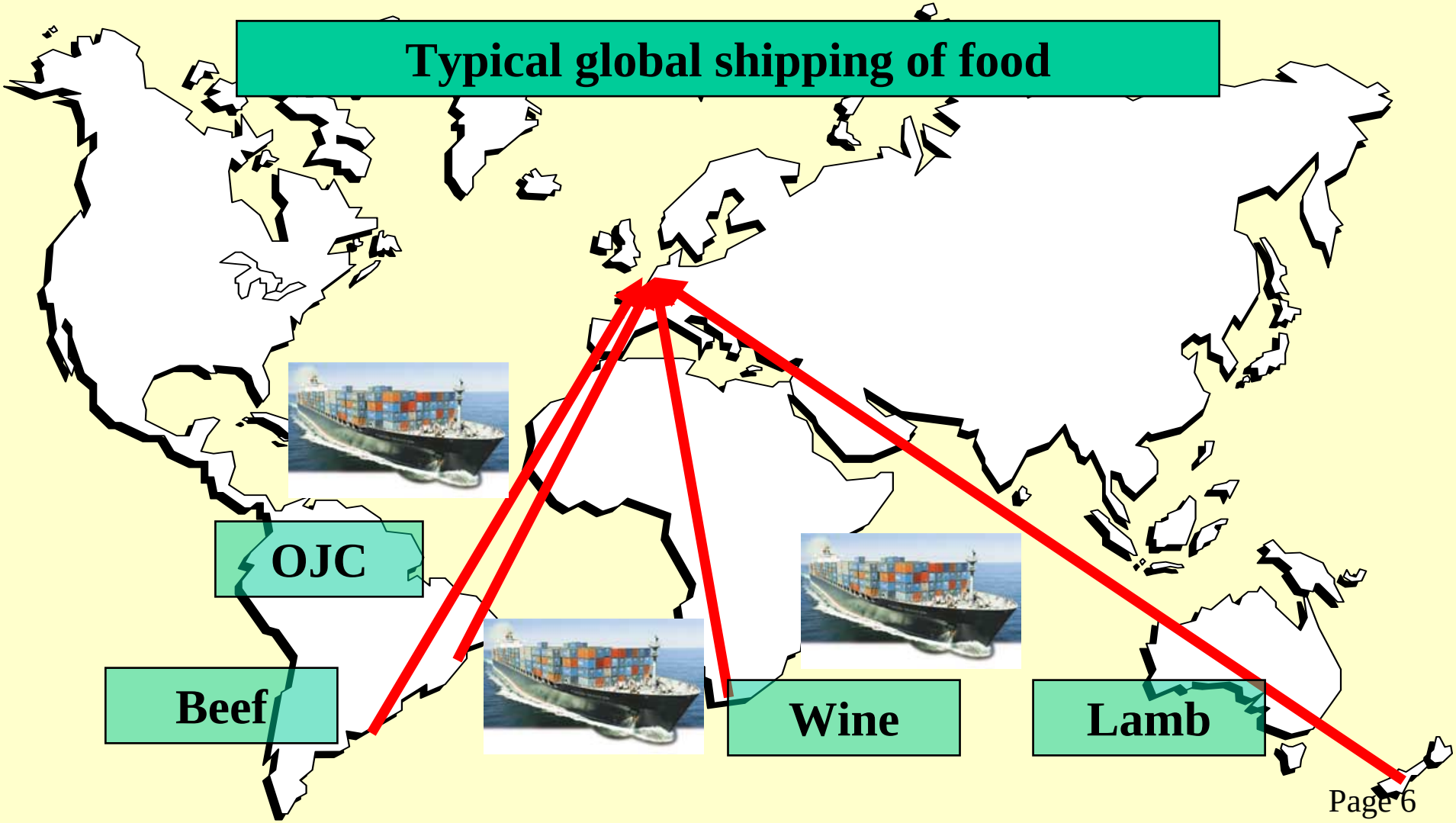
Food examples and places of origin

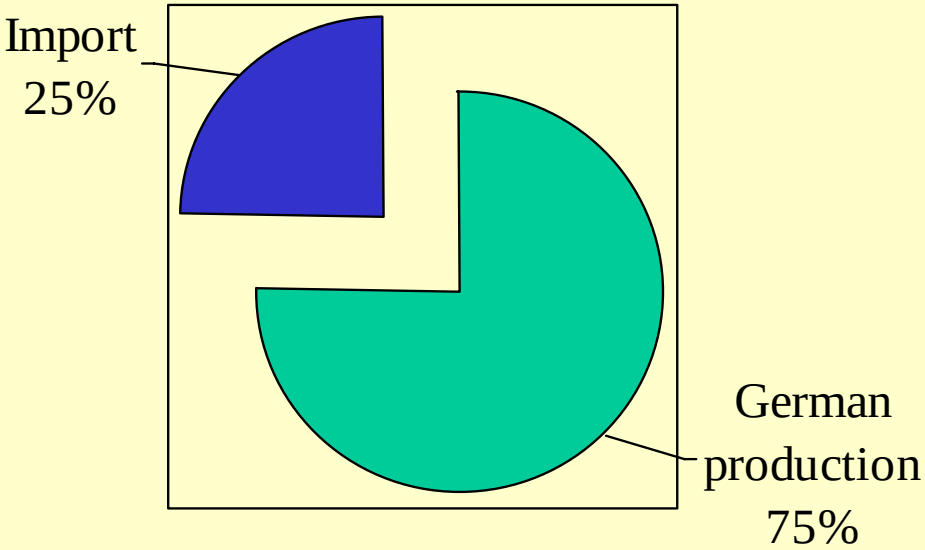
1. Fruit juices (Brazil, Europe, Germany) [Schlich:InLCA 2003]
2. Lamb meat (Germany, Hungary, New Zealand) [Schlich:InLCA 2003]
3. **Beef** (Argentina, Germany, Hungary)
4. **Pork** (Germany, Hungary)
5. **Wine** (Germany, Hungary, South Africa)

Typical global shipping of food



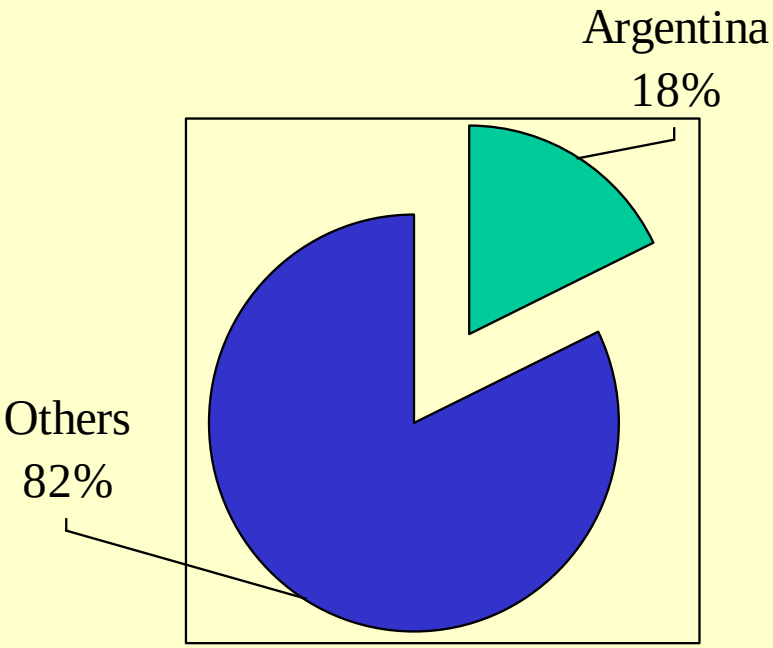
Case study beef: Market data in Germany

Beef per capita: 8.8 kg/a



Beef in total: 730,000 t/a

Beef in Germany: Import data



Imported beef in total: 182,000 t/a

Beef: Results

Case	Beef [kg/a]	Specific energy [kWh/kg]
Ger A (1)	7,000	3.5
Ger B (1)	2,500	6
Arg A (2)	80,000,000	1.4
Hu A (3)	800,000	1.8

(1): Data of local German farmers: farming, slaughter including local transport.

(2): Main import company from Argentina: data include farming, slaughter, sea container vessel to Hamburg and German truck.

(3): Hungarian farming and slaughter; truck transport to Germany must still be added (under calculation)

Beef: Data assessment

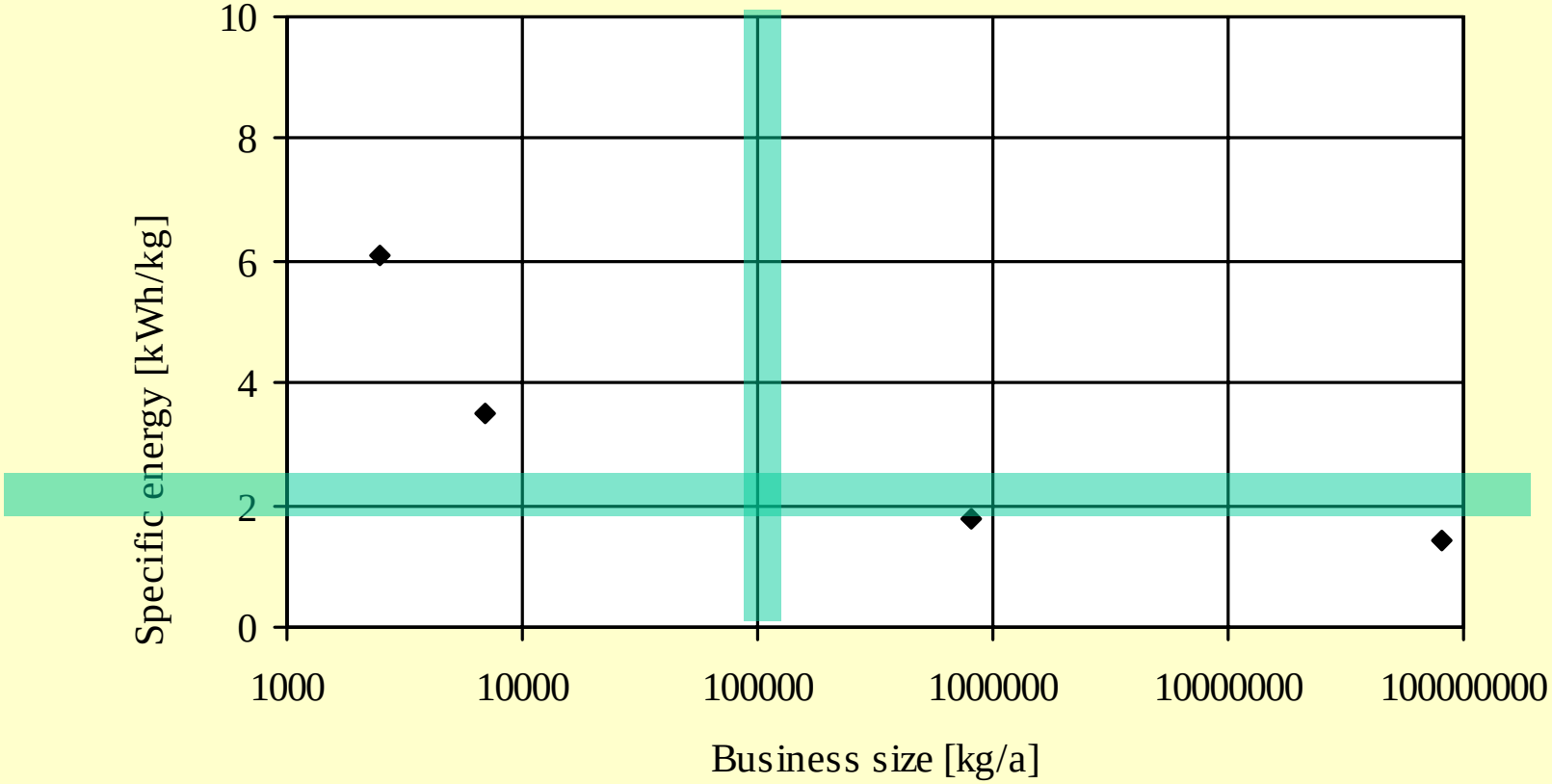
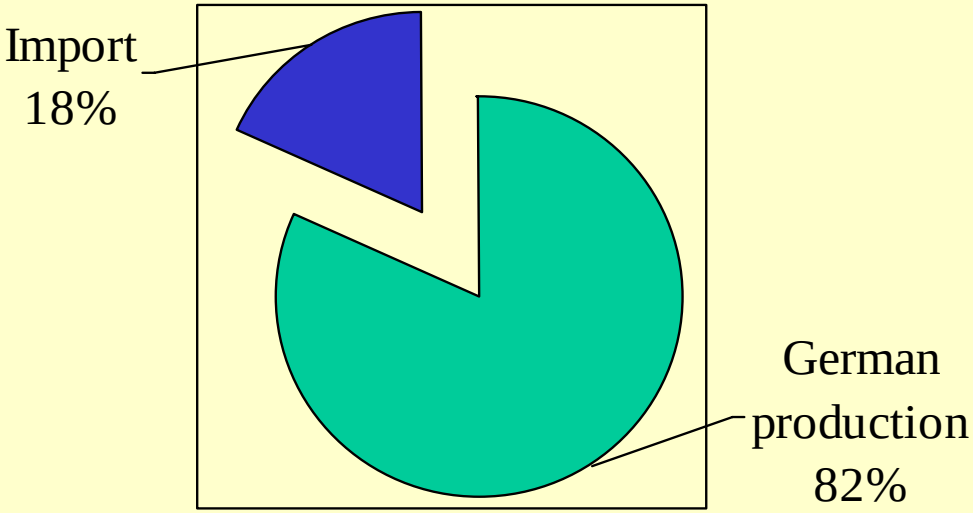


Fig. 1: Specific energy turnover of beef versus business size

Case study pork: Market data in Germany

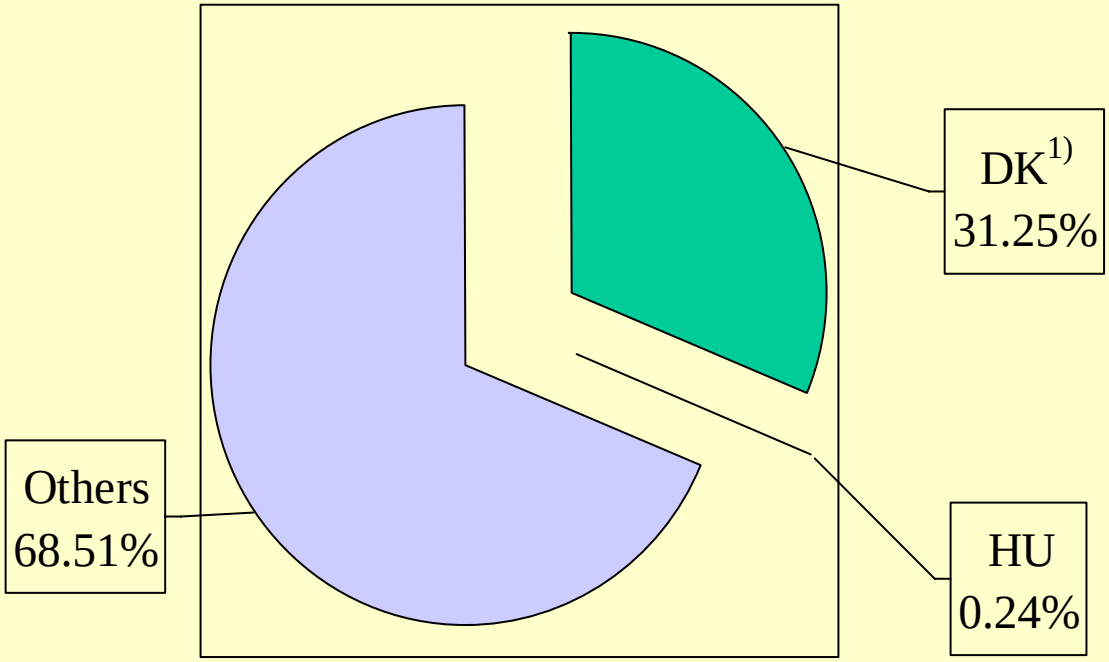
Pork per capita: 39.5 kg/a



Pork in total: 4,600,000 t/a

Pork in Germany: Import data

Imported pork in total: 830,000 t/a



1) Danish pork under research

Pork: Results

Case	Pork per a [kg]	Specific energy [kWh/kg]
Ger A	58,800	4.9
Ger B	2,500	9.1
Ger C	8,600	6.5
Ger D	138,000	3.4
Ger E	18,500	4.1
Hu A	625,000	3.9
Hu B	420,000	3.7
Hu C	370,000	3.8

Pork: Data assessment

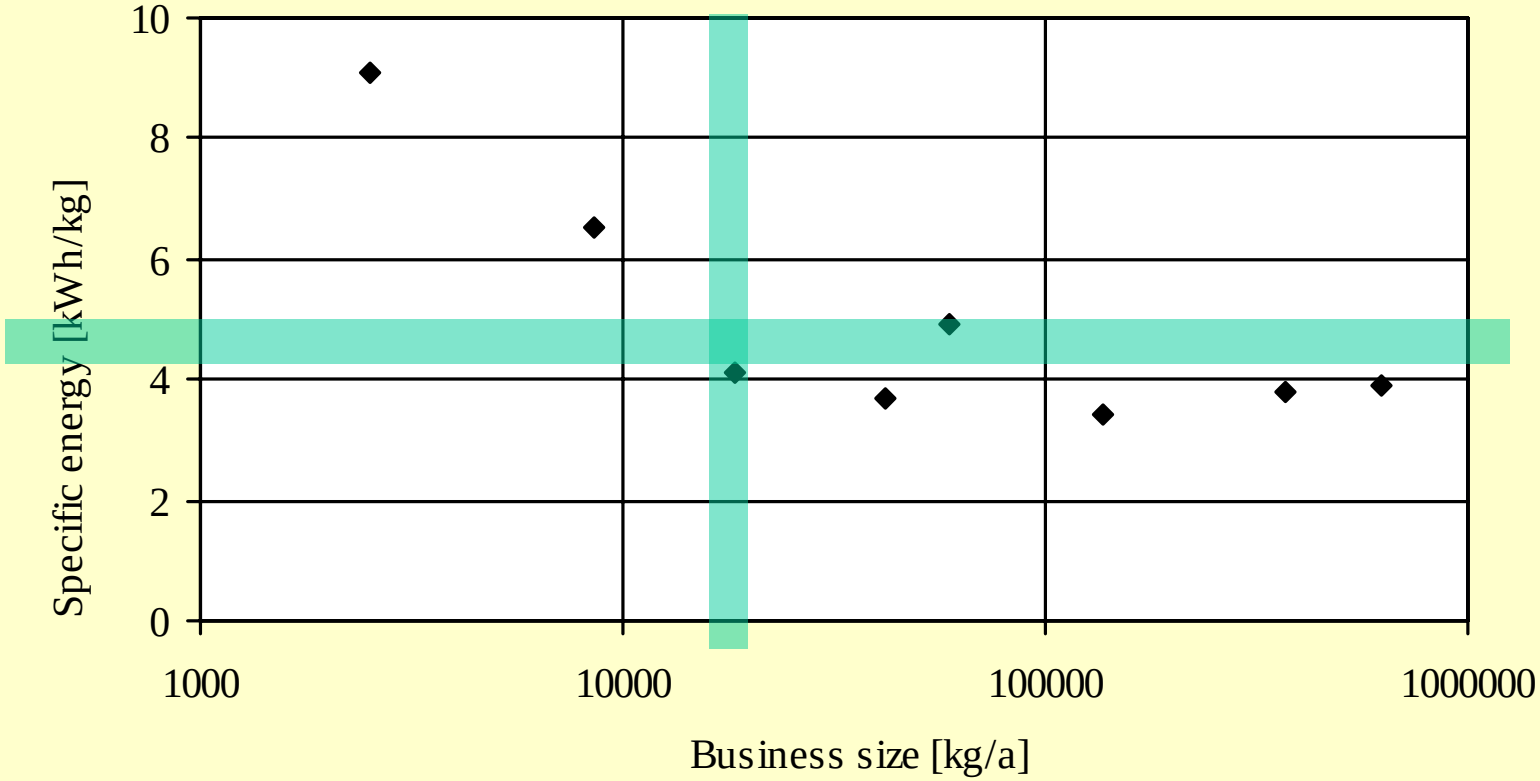
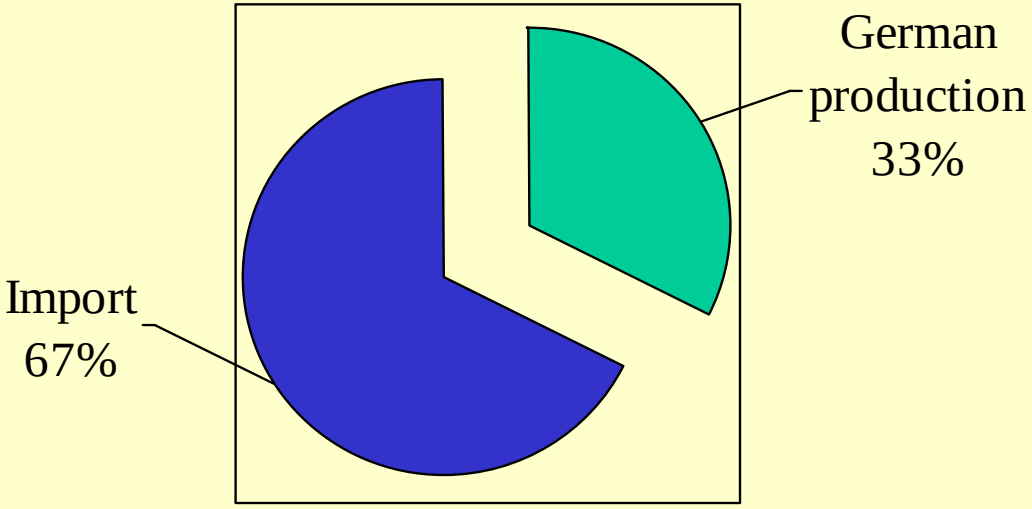


Fig. 2: Specific energy turnover of pork versus business size

Case study wine: Market data in Germany

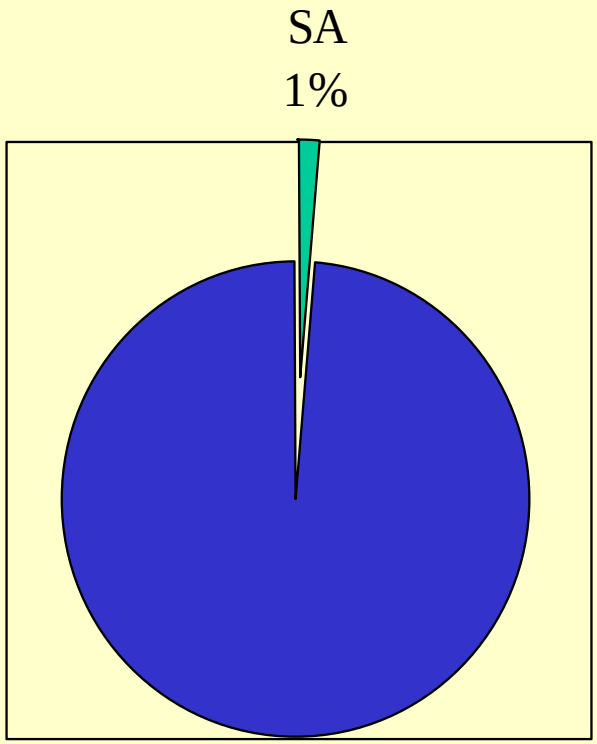
Wine per capita: 24 l/a

(incl. sparkling wine)



Wine in total: 20,000,000 hl/a

Wine in Germany: Import data



Imported wine in total: 13,300,000 hl/a

Wine: Results of typical cases

Winery	Area	Production	Diesel	Electricity	Natural gas	Heating oil
	[ha]	[hl]	[l]	[kWh]	[m^3]	[l]
W2002/1	12.5	1,000	6,045	23,390	150	250
M2001/1	4.4	247.50	5,743	7,595	0	0
M2001/2	4.1	357.89	3,828	4,216	0	400
M2001/5	2.1	153.40	5,290	1,496	0	300
HU2002/3	200	16,000	13,100	54,972	19,900	0
B2001/3	22.5	2,100	2,955	6,490	0	15,000
B2001/6	98.5	8,500	9,970	125,000	0	0
HB2001	254.3	13,640	25,695	330,872	0	71,616

Wine: Data assessment (region 1, Germany)

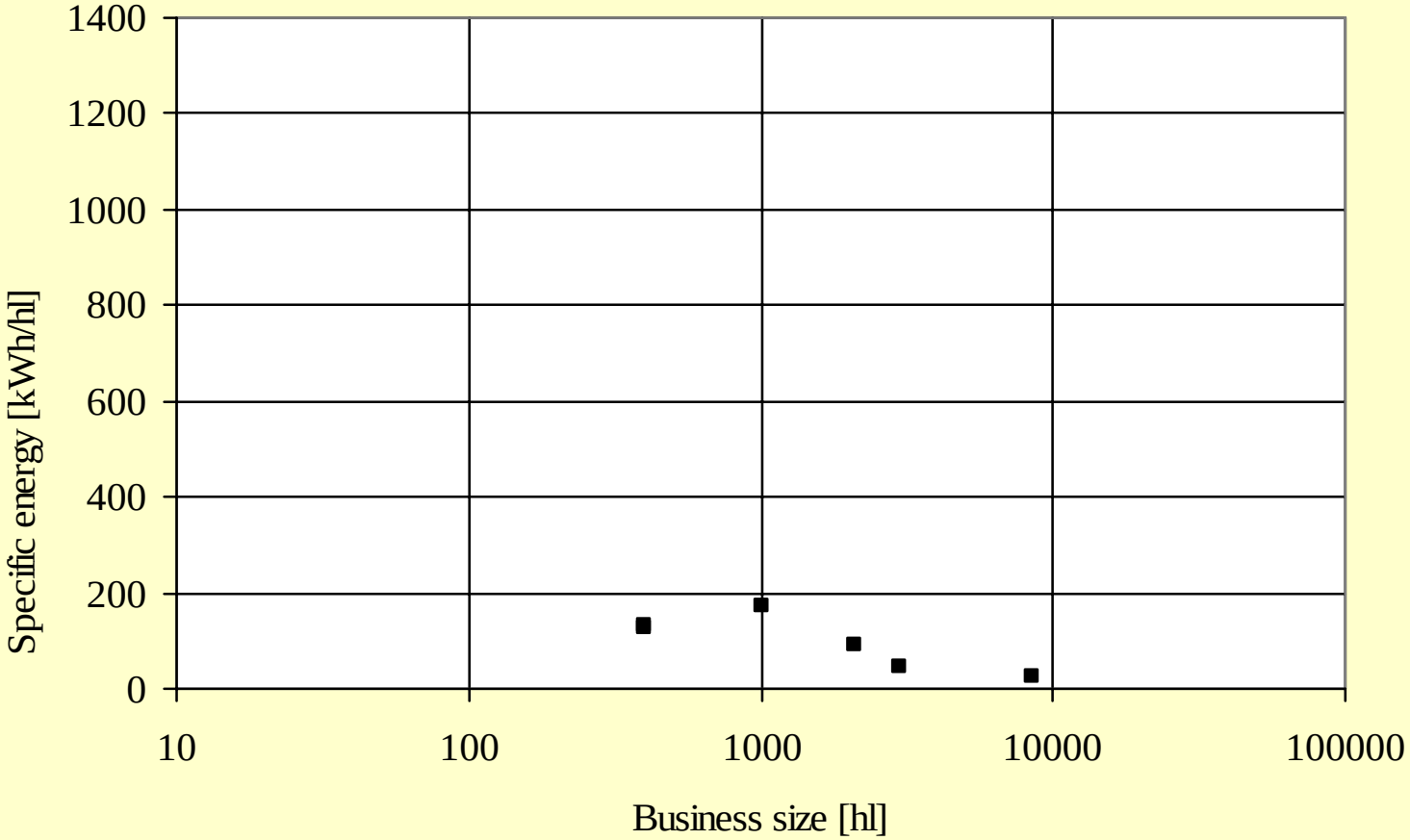


Fig. 3: Specific energy turnover of wine versus business size – German region 1

Wine: Data assessment (regions 1+2, Germany)

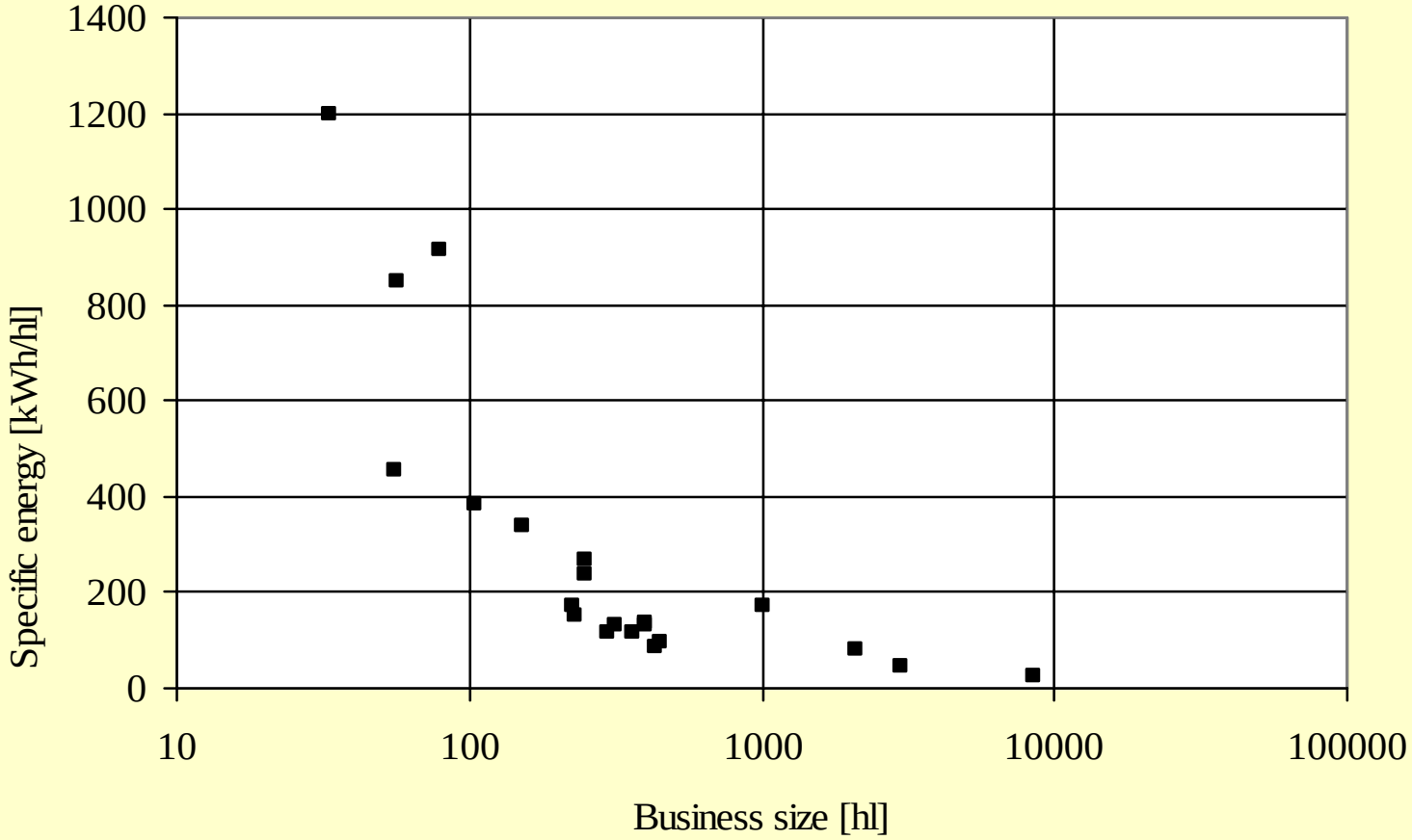


Fig. 4: Specific energy turnover of wine versus business size – German regions 1 and 2

Wine: Data assessment (regions 1+2+3, Germany)

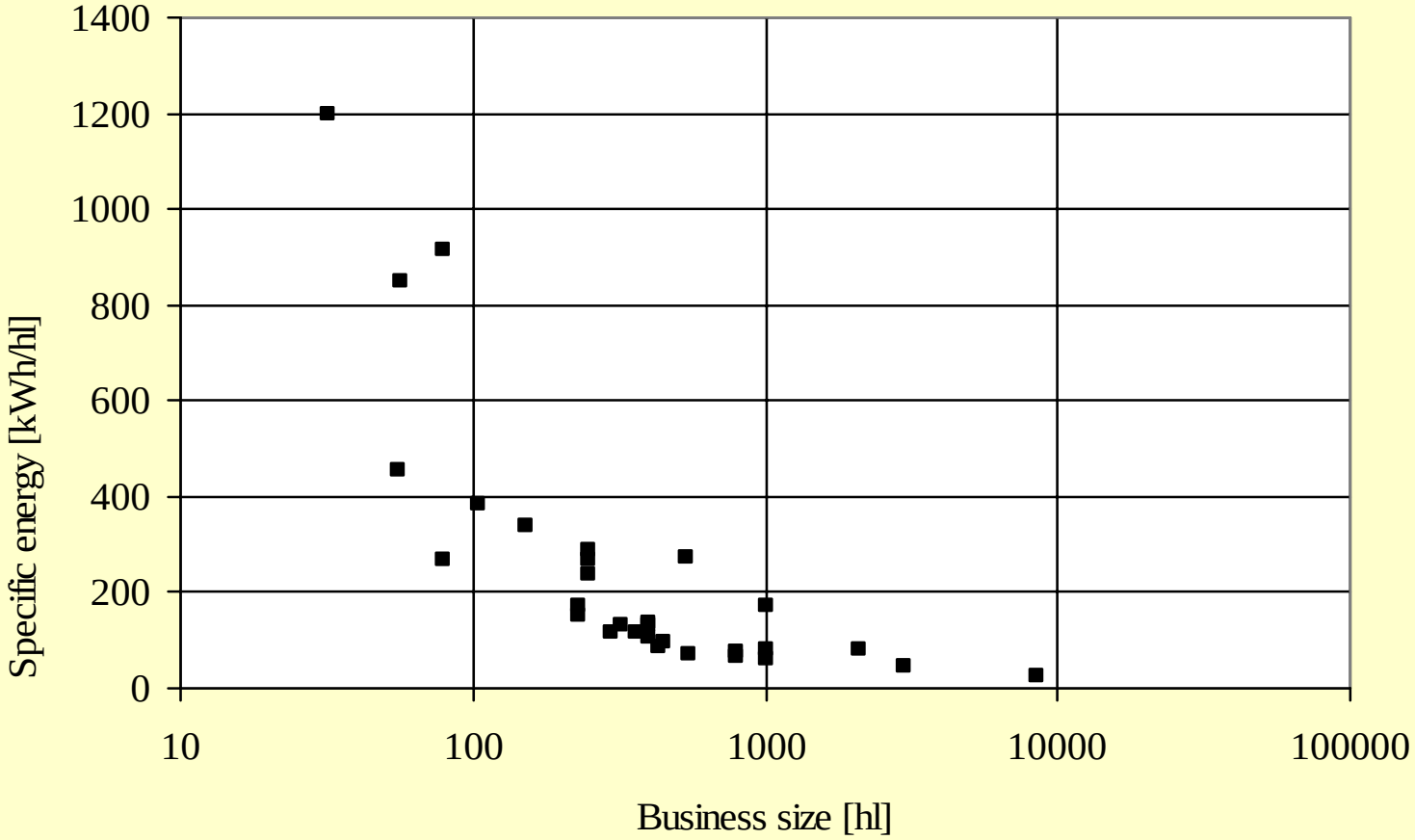


Fig. 5: Specific energy turnover of wine versus business size – German regions 1, 2 and 3

Wine: Data assessment (German regions + Hungary)

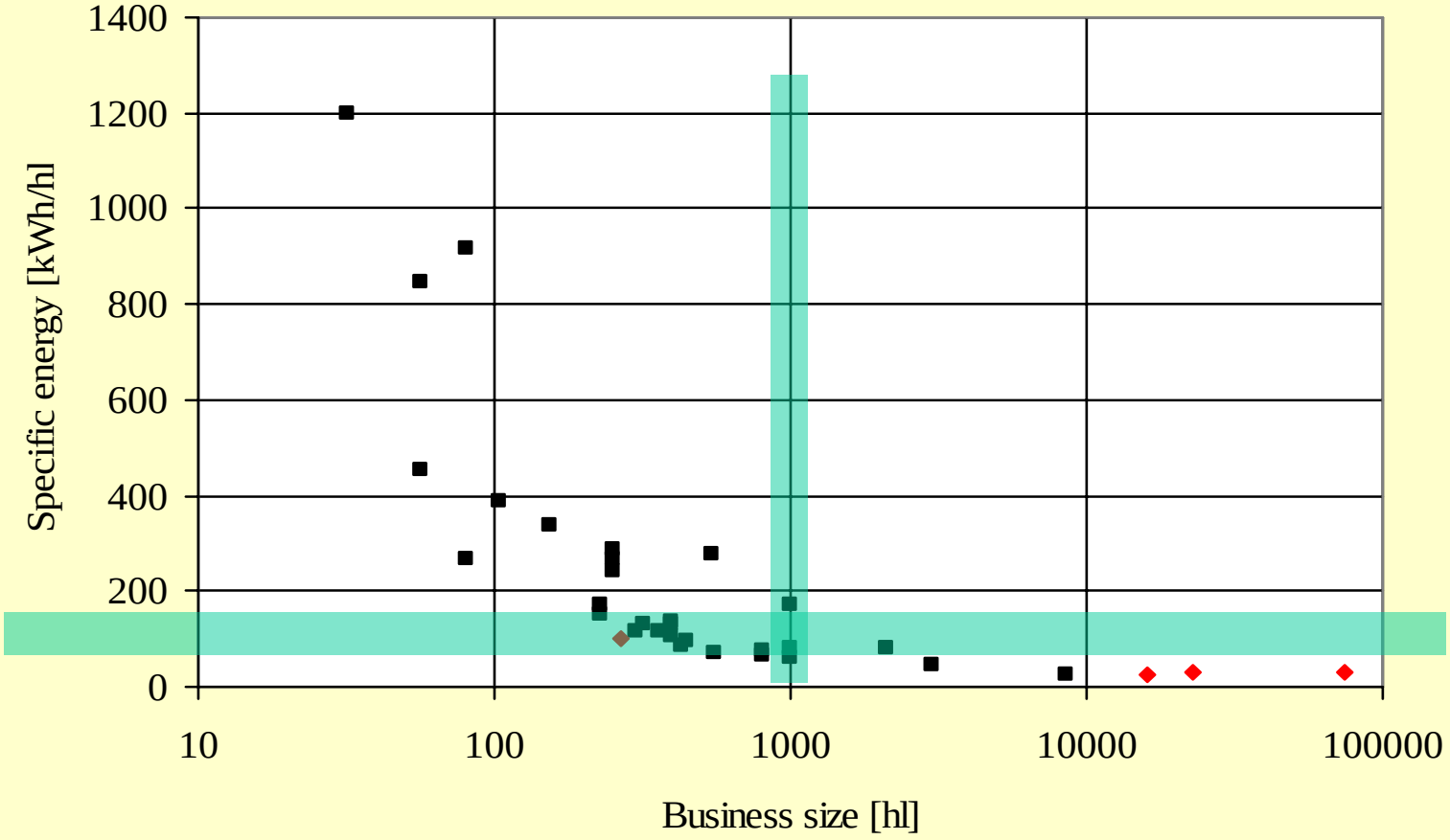


Fig. 6: Specific energy turnover of wine versus business size – Germany, Hungary

Wine: Data assessment (German regions + Hungary + South Africa)

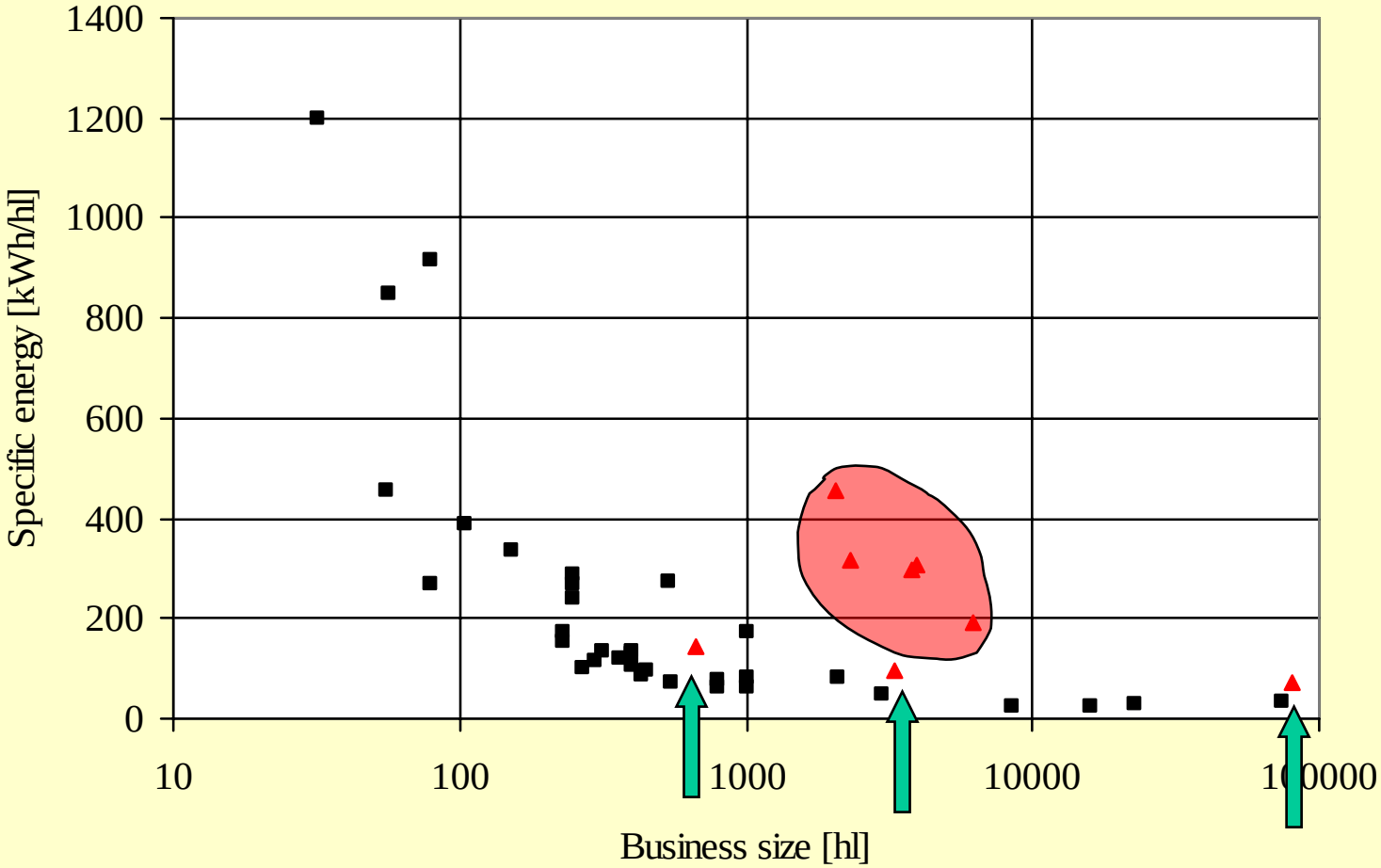


Fig. 7: Specific energy turnover of wine versus business size – Germany, Hungary, South Africa

Conclusions, Recommendation and Outlook (1)

- Results show in all cases degressive dependencies of specific energy turnover and business size!
- No relation between specific energy intake and marketing distance!
- Small units are facing severe disadvantages because of missing logistics and bad operational efficiency!
- The ecological quality depends mainly on the operational efficiency and not on the marketing distance!

Conclusions, Recommendation and Outlook (2)

- Small scale units can obtain energy efficient production and distribution by good cooperation!
- South African wineries prove: Big scale units may waste energy as well! Reasons are to identify!
- Hence: Each case has to be investigated and prejudices are definitely misleading!

Ecology of Scale

The conclusions are valid for the researched examples, but:

The claims for „food regionality“ in Germany are not generally valid!

Many thanks:

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