Quality, Reputation and the Price of Wine

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Our agenda

- Explaining Austrian quality wine prices
  - Very interesting and detailed panel data set
  - Hedonic price analysis
- Short- and long-run effects of quality (reputation) on prices
  - Wine guide reviews (Fallstaff)
- Modelling the link between quality and reputation
- Accounting for endogeneity due to the selection procedure of graded wines
  - Heckman´s approach

Wine quality and reputation

- A complex product (experience good)
  - Consumers lack perfect information about the true quality
    - Costly to improve their information
  - Hence, third-party (expert) reviews may reduce this gap
    - Risk reduction
- *Shapiro (1983)*: reputation (influenced by prior quality) that drives consumer decisions leads to higher prices
  - Quality has (i) an immediate and (ii) a long-run effect
  - These should be decoupled
- Empirical importance of reputation: *Landon and Smith (1998)*, *Oczkowski (2001)*, *Benfratello et al. (2009)*, *Oczkowski (2014)*
  - Neglecting reputation effects might lead to an over-estimated impact of short-run changes in quality

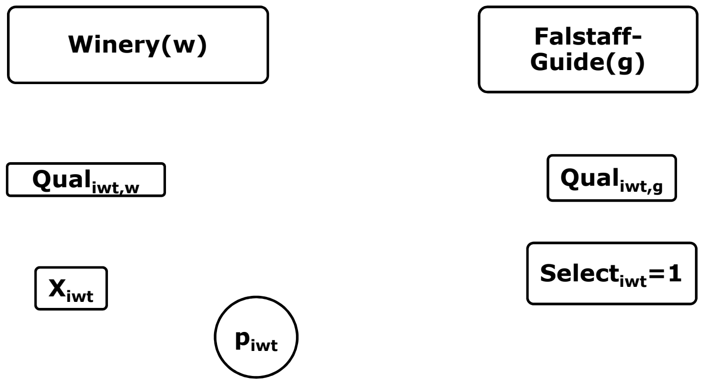
Concerns about endogeneity

- Endogeneity is an important feature, even if neglected in many empirical works – *Oczkowski (2014)*
- Due to measurement error in quality
  - "OLS procedures may seriously distort the statistical significance of attributes" – *Oczkowski (2001)*
- Due to omitted variables
  - experts may be wrong in assessing "en primeur" wine quality (unobserved quality) – *Dubois and Nauges (2010)*
- Caused by the sample selection procedure of the wine guide
  - Non-randomly selected sample
  - 2-step approach

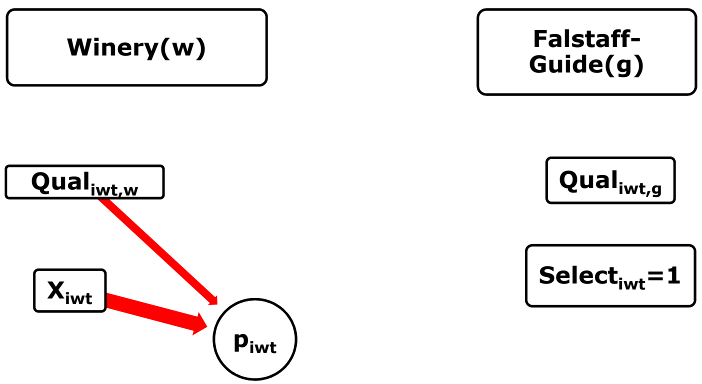
Data

- More than 7,000 single Austrian wines (2004-2007), 488 wineries
  - About 35% of the annual national production of quality wines
  - Characteristics:
    - type (red/rose/white)
    - year of harvest
    - grape
    - size of the winery
    - lag between harvest and bottling
  - Experts´ grades on wines:
    - Falstaff-Wine-Guide (scale 1-100: color, appearance, aroma, bouquet, flavor and finish)
  - Reputation of the winery:
    - Scale between 0 and 3, later 5 stars (normalized to 1)
- Selection bias: quality may be endogeneous in the selected sample
  - Basically, the winegrowers decide which wines are selected for grading
  - Only quality wines

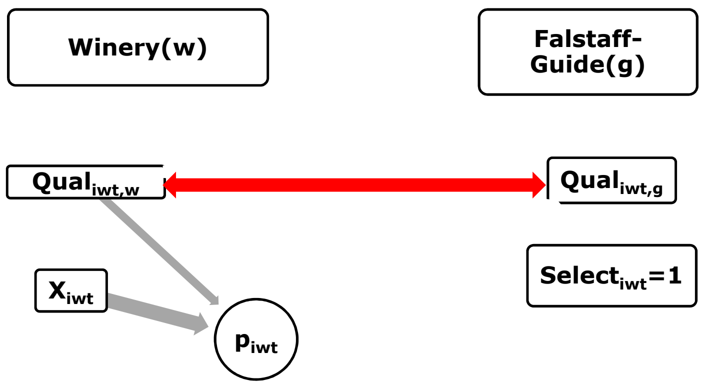
Selection process



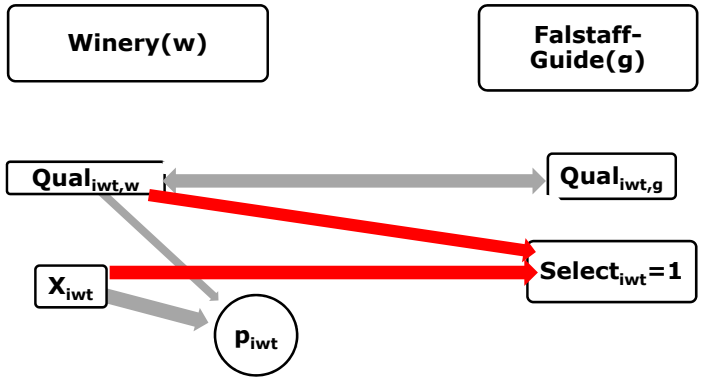
Selection process



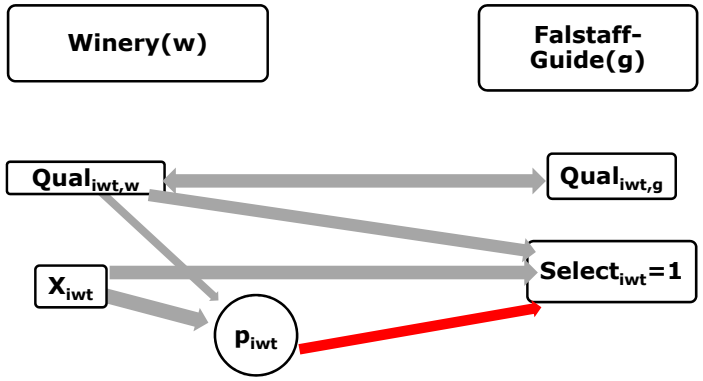
Selection process



Selection process



Selection process



2-step modelling approach

Wooldridge (2001)

(i): probit (eq. 4) **(ii)**: 2SLS (eq. 1-3)

$$(1)\ Ln(Price_{iwt}) = \alpha_1 Qual_{iwt} + \alpha_2 Rep_{wt} + \boldsymbol{X}_{iwt}\boldsymbol{\beta} + IMR_{iwt}\gamma + \varepsilon_{iwt}$$

$$(2)\ Qual_{iwt} = (\boldsymbol{X}_{iwt},\ IMR_{iwt},\ \boldsymbol{Z}_{iwt})\boldsymbol{\delta}_1 + u_{1,iwt}$$

$$(3)\ Rep_{wt} = (\boldsymbol{X}_{iwt},\ IMR_{iwt},\ \boldsymbol{Z}_{iwt})\boldsymbol{\delta}_2 + u_{2,iwt}$$

$$(4)\ Select_{iwt} = 1\left((\boldsymbol{X}_{iwt}, \boldsymbol{Z}_{iwt})\boldsymbol{\delta}_3 + u_{3,iwt} > 0\right)$$

- Select = 1 if a wine is selected for evaluation
- exogenous variables (summarized in **X**) incl. fixed effects
- additional instrumental variables **Z**
- IMR: inverse Mills ratio

Findings (selection)

Table 1: Regression Results Explaining the Selection of Wines for Evaluation

Dependent Variable	Select	
Method	Probit	
Model	[1]	
CONST	-4.5457	(-1.21)
Number of times Wine received Grade between 1999 and 2009	0.3513	(39.95)
Number of different Wines of Winery (in Year t)	-0.0106	(-4.75)
Harvest 2002	0.0108	(0.06)
Harvest 2003	-0.0088	(-0.07)
Harvest 2004	-0.0684	(-0.70)
Harvest 2005	-0.0767	(-1.98)
Average Quality (at t-1)	0.0108	(1.98)
Average Quality (at t-2)	0.0122	(0.66)
Average Quality (at t-3)	-0.0242	(-1.50)
Average Quality (at t-4)	0.0095	(0.62)
Time between Harvest and Bottling: 2 Years	0.4689	(7.94)
Time between Harvest and Bottling: 3 Years	0.8468	(6.87)
Winery Effects	Yes (316)	
Vintage Effects	Yes (3)	
Variety of the Grape	Yes (31)	
Type of Wine	Yes (3)	
Type of Sweet Wine	Yes (3)	
N	16,758	
l	-8,721.90	
Pseudo-R^2	0.241	
χ^2-test statistic on instruments	1638.52 {10}	[0.0000]
[df] [p-value]	1632.91 {6}	[0.0000]

Notes: t-values are reported in parentheses.

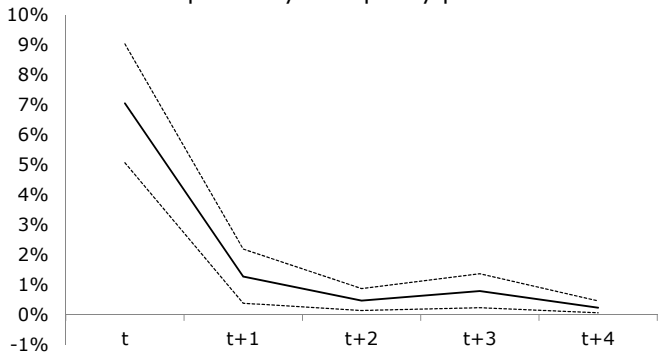
Findings (quality and reputation effects on price)

Table 2: Regression Results Explaining the Effects of Quality and Reputation

Dependent Variable	ln(price)	Reputation	ln(price)	Reputation
Method	2SLS		2SLS	
Model	[1]		[2]	
CONST	-7.6367	-6.7727	-1.1488	-6.0788
	(-42.95)	(-16.87)	(-4.78)	(-15.43)
Quality	0.1049	0.0058	0.0705	
	(54.41)	(8.51)	(6.90)	
Reputation	0.6770		0.3884	
	(5.48)		(2.85)	
Average Quality (at t-1)		0.0338		0.0330
		(16.54)		(15.60)
Average Quality (at t-2)		0.0134		0.0125
		(7.42)		(6.79)
Average Quality (at t-3)		0.0209		0.0205
		(13.95)		(13.53)
Average Quality (at t-4)		0.0061		0.0063
		(4.42)		(4.48)
Time between Harvest and Bottling: 2 Years	0.3830	-0.0098	0.4293	-0.0026
	(36.69)	(-2.45)	(22.94)	(-0.43)
Time between Harvest and Bottling: 3 Years	0.7678	-0.0249	0.8561	-0.0077
	(24.70)	(-1.98)	(20.97)	(-0.53)
IMR			-0.0330	0.0005
			(-2.73)	(0.04)
Winery Effects	Yes (353)	Yes (353)	Yes (346)	Yes (346)
Vintage Effects	Yes (3)	Yes (3)	Yes (3)	Yes (3)
Variety of the Grape	Yes (31)	Yes (31)	Yes (31)	Yes (31)
Type of Wine	Yes (3)	Yes (3)	Yes (3)	Yes (3)
Type of Sweet Wine	Yes (3)	Yes (3)	Yes (3)	Yes (3)
Instrumented Variables	Reputation		Reputation	
			Quality	
N	7,403	7,403	7,358	7,358
R^2	0.823	0.940	0.822	0.940

Effect of quality increase

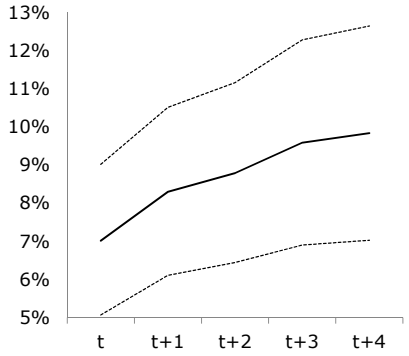
Price increases if winegrowers increase the wine quality for one time period by one quality point.



Year	t	t+1	t+2	t+3	t+4
Median	7.1%	1.3%	0.5%	0.8%	0.2%

Aggregate price effects

Price increases if winegrowers succeed in increasing the wine quality permanently by one quality point.



Year	t	t+1	t+2	t+3	t+4
Median	7.1%	8.3%	8.8%	9.6%	9.8%

Conclusions

- Significant effects of wine-guide reviews on prices
- Sizable cumulative quality effects over time
  - also strong influence of winery reputation (long-run quality effects)
  - winery reputation is determined by prior average quality scores
  - time span between harvest and bottling
- Two-step Heckman approach seems to be justified
  - selection bias (OLS overstates short- and long-run quality effects)

Thanks for your attention!

Literature

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Appendix (quality equation)

Table C1: Regression Results Explaining Product Quality

Dependent Variable	Quality
Method	2SLS
Model	[2]
CONST	140.7977
	(-99.54)
Number of times Wine	0.3762
Number of different Wines	0.0149
of Winery (in Year t)	(-0.98)
Harvest 2002	0.1302
	(0.44)
Harvest 2003	0.2812
Harvest 2004	[illegible]
Harvest 2005	-0.3899
	(4.66)
Average Quality (at t - 1)	0.2243
	(6.35)
Average Quality (at t - 2)	-0.2404
	(-6.91)
Average Quality (at t - 3)	0.1258
	(4.71)
Average Quality (at t - 4)	-0.0273
	(-0.85)
Time between Harvest and Bottling: 2 Years	1.8117
	(16.88)
Time between Harvest and Bottling: 3 Years	3.4322
	(-16.79)
IMR	1.1667
	(5.18)
Winery Effects	Yes (346)
Vintage Effects	Yes (3)
Variety of the Grape	Yes (31)
Type of Wine	Yes (3)
Type of Sweet Wine	Yes (3)
N	7,358
R^2	0.8388
h test statistic on instruments	25.84
df	(10, 6958)
p-value	0.000