

Problem Set 3: Discrete Choice

Machine Learning and Causal Inference

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1 Binary Outcome Models

1.1 Naïve Logit and Probit

Naïve estimations of

$$\mathbb{P}(\text{Vote} = 1|x) = \Lambda(x'\beta) \quad (1)$$

$$\mathbb{P}(\text{Vote} = 1|x) = \Phi(x'\beta) \quad (2)$$

using logit (regression 1) and probit (regression 2) are presented in Figures 1 and 2, respectively.

vote	Odds ratio	Std. err.	z	P> z	[95% conf. interval]	
sex	.7948233	.1286154	-1.42	0.156	.578805	1.091463
age	1.017204	.0048494	3.58	0.000	1.007743	1.026753
educ						
LOWEST LEVEL	1.173776	.659679	0.29	0.776	.3901196	3.53161
INTERMEDIARY L..	2.182421	1.229571	1.39	0.166	.7233917	6.584206
QUALI.UNIV.APP~.	5.299154	3.477246	2.54	0.011	1.464393	19.17589
QUALI.FOR UNIV..	3.899269	2.230477	2.38	0.017	1.270794	11.96441
OTHER SCHOOL C..	.4822247	.4182655	-0.84	0.400	.0880939	2.639691
STILL AT SCHOOL	1	(empty)				
work						
EMPLOYED, PART..	1.294201	.368854	0.90	0.366	.7402952	2.262552
LESS THAN PART..	.9822404	.3652964	-0.05	0.962	.4738653	2.036014
NOT WORKING	.9447561	.1809647	-0.30	0.767	.6490454	1.375195
_cons	3.66388	2.254295	2.11	0.035	1.097029	12.2367

Figure 1: Naïve Logit Regression

The estimates reported are the odds ratio. This simply states how likely a individual with a given characteristic is to vote (in this case) compared to the baseline characteristic. In the case of **sex**, male is base category so being female is associated being .79 as likely to vote, i.e. less likely than males.

For continuous predictors the odds ratio simply imply that raising age by one year, on average is associated with 1.01 increase in probability to vote.

Generally, having higher education makes an individual more likely to vote (compared to not having education). Being in part-time employment raises probability to vote, while less than part-time and being unemployment does not.

The coefficients for the probit estimates of (2) in Figure 2 are not directly interpretable. The sign is interpretable however such that characteristics associated with positive effects (relative to their reference category) on probability to vote is

- age, part-time employment (relative to full-time employment), less than part-time employment (relative to full-time employment). Low education level, middle education, university education (relative to no education)

vote	Coefficient	Std. err.	z	P> z	[95% conf. interval]	
sex						
FEMALE	-.1064236	.078581	-1.35	0.176	-.2604396	.0475923
age	.0085944	.0024308	3.54	0.000	.0038302	.0133587
educ						
LOWEST LEVEL	.1152748	.2963507	0.39	0.697	-.465562	.6961116
INTERMEDIARY LEVEL	.4255269	.2966948	1.43	0.152	-.1559843	1.007038
QUALI.UNIV.APPL.~.	.8364753	.3306777	2.53	0.011	.188359	1.484592
QUALI.FOR UNIVER..	.6967101	.2998163	2.32	0.020	.1090809	1.284339
OTHER SCHOOL CER..	-.371007	.4953419	-0.75	0.454	-1.341859	.5998454
STILL AT SCHOOL	0	(empty)				
work						
EMPLOYED, PART-T..	.1227282	.1368663	0.90	0.370	-.1455247	.3909811
LESS THAN PART-T..	.0028237	.181144	0.02	0.988	-.3522121	.3578594
NOT WORKING	-.0330156	.0942228	-0.35	0.726	-.2176888	.1516576
_cons	.6740682	.3134289	2.15	0.032	.0597588	1.288378

Figure 2: Naïve Probit Regression

those associated with negative effects are

- female (relative to being male), other school certificatte (relative to no education), and not working (relative to full-time employment)

1.2 Marginal Effect at the Mean

The marginal effects at the mean of the logit model is presented in Figure 3 while effects for the probit model are in Figure 4. To find the probability of voting for a 26-year-old working male with an

	Delta-method				[95% conf. interval]	
	dy/dx	std. err.	z	P> z		
sex	-.0349548	.0146738	-2.38	0.017	-.0637149	-.0061948
age	.0033776	.0004603	7.34	0.000	.0024754	.0042798

Figure 3: Marginal Effects of Logit at the Mean

	Delta-method				[95% conf. interval]	
	dy/dx	std. err.	z	P> z		
sex	-.0344191	.0147326	-2.34	0.019	-.0632946	-.0055437
age	.0033919	.0004655	7.29	0.000	.0024795	.0043043

Figure 4: Marginal Effects of Probit at the Mean

intermediate level of education, we simply substitute the coefficients from Figures A1 and 2 to the

regression function as such

$$\begin{aligned}\frac{p}{1-p} &= \exp(0.017 * 26 + 0.78 * 3) && \text{(Logit)} \\ &= \exp(2.78) \\ \Leftrightarrow \underline{\underline{p}} &= 0.941\end{aligned}$$

$$\begin{aligned}p &= 1 - \phi(-[0.0086 * 26 + 0.43 * 3]) && \text{(Probit)} \\ &= 1 - \phi(-1.51) \\ &= 1 - 0.0655 \\ \Leftrightarrow \underline{\underline{p}} &= 0.935\end{aligned}$$

1.3 Binary Estimation

This code snippet below is developed in cooperation with Manohar Gannavarapu and John Searight as allowed by Prof. Wang.

```
drop if pv01 < 0
gen vote2 = (pv01!=91)

global regressors "i.sex age i.educ i.work"

program define my_sigmoid
    args Y Xb
    qui replace `Y' = -ln(1+exp(-`Xb')) if $ML_y1==1
    qui replace `Y' = -`Xb' - ln(1+exp(-`Xb')) if $ML_y1==0
end

ml model lf my_sigmoid (vote2 = $regressors)
ml maximize
```

which outputs numerically equivalent estimations as Figure A1 (same as Figure 1 but with coefficients instead of odds ratios).

2 Multinomial Models

2.1 Naïve Multinomial Model

Naïve estimations of multinomial logit

$$\mathbb{P}(\text{party} = j|z) = F_j(z'\beta), \quad j \in \{\text{CDU/CSU}, \text{SPD}, \text{GREENS}\} \quad (3)$$

is presented in Table 1. Now the estimated effects are for the probability to vote either SPD or The Greens compared to the probability of voting for CDU/CSU. The estimates are the Relative Risk Ratios (RRR) which is the natural generalization of the odds ratio. Hence, e.g. females is more likely to vote for the The Greens than men relative (by 1.39 times) compared to voting for CDU/CSU everything else held constant.

	(1)		
	VOTING INTENTION: FEDERAL ELECTION		
	CDU_CSU	SPD	THE_GREENS
MALE	1 (.)	1 (.)	1 (.)
FEMALE	1 (.)	1.065 (0.125)	1.390** (0.176)
RESPONDENT: AGE	1 (.)	1.005 (0.00385)	0.996 (0.00393)
NO CERTIFICATE	1 (.)	1 (.)	1 (.)
LOWEST LEVEL	1 (.)	2.078 (1.241)	0.865 (0.588)
INTERMEDIARY LEVEL	1 (.)	1.938 (1.156)	1.512 (1.013)
QUALI.UNIV.APPL.SCI.	1 (.)	2.191 (1.360)	2.438 (1.678)
QUALI.FOR UNIVERSITY	1 (.)	2.016 (1.207)	3.096 (2.068)
OTHER SCHOOL CERTIF.	1 (.)	0.00000262 (0.00163)	0.908 (1.225)
STILL AT SCHOOL	1 (.)	4.530 (4.026)	2.950 (2.898)
EMPLOYED, FULL-TIME	1 (.)	1 (.)	1 (.)
EMPLOYED, PART-TIME	1 (.)	1.027 (0.212)	1.205 (0.231)
LESS THAN PART-TIME	1 (.)	2.378** (0.783)	2.404** (0.774)
NOT WORKING	1 (.)	1.140 (0.167)	0.717* (0.111)
r2-p	0.0418		
n			

Exponentiated coefficients; Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 1: Naïve Multinomial Logit

	Delta-method					
	dy/dx	std. err.	z	P> z	[95% conf. interval]	
1.sex	(base outcome)					
2.sex						
_predict						
1	-.0451325	.0358099	-1.26	0.208	-.1153186	.0250536
2	-.0115171	.0237578	-0.48	0.628	-.0580815	.0350474
3	.0566496	.029201	1.94	0.052	-.0005834	.1138825

Figure 5: Marginal Effects of Naïve Multinomial Logit for Females at the Mean

	Delta-method					
	dy/dx	std. err.	z	P> z	[95% conf. interval]	
age						
_predict						
1	-.0001842	.0010845	-0.17	0.865	-.0023098	.0019415
2	.0013186	.0010284	1.28	0.200	-.000697	.0033343
3	-.0011345	.0006768	-1.68	0.094	-.002461	.0001921

Figure 6: Marginal Effects of Naïve Multinomial Logit for Age at the Mean

2.2 Means Marginal Effects

Marginal effects at the mean for females is presented in Figure 5. It is seen that females are less likely to vote for CDU/CSU (Category 1) or SPD (Category 2) than males. They are more likely to vote for The Greens.

Given that the population is ageing I would expect higher age to be associated to vote for one of the centrist parties (CDU/CSU or SPD). Running marginal effects for age is presented in Figure 6. This confirms that an increase in age is associated with higher probability to vote for SPD (Category 2), but is (surprisingly) associated with lower probability to vote for CDU/CSU. Unsurprisingly, older people are less likely to vote for the progressive The Greens.

2.3 Manual Estimation

As in Section 1.3, the code snippet below is developed in cooperation with Manohar Gannavarapu and John Searight as allowed by Prof. Wang.

```

program define my_multi_logit
    args lnf Xb2 Xb3
    quietly replace `lnf' = - ln(1+exp(`Xb2')+exp(`Xb3')) if $ML_y1==1
    quietly replace `lnf' = `Xb2' - ln(1+exp(`Xb2')+exp(`Xb3')) if $ML_y1==2
    quietly replace `lnf' = `Xb3' - ln(1+exp(`Xb2')+exp(`Xb3')) if $ML_y1==4
end

ml model lf my_multi_logit (xb2:pv01= $regressors) (xb3:= $regressors)
ml maximize

```

which outputs numerically equivalent estimations as Table 1 with coefficients instead of risk-relative ratios (see Figure A2).

2.4 Conditional Logit

The output from the conditional logit model is presented in Table 2. Please refer to the attached `.do`-file for the data wrangling part necessary for Stata's `asclogit` command. The alternative-varying variable is the party to vote for (`options`) and the case-specific variables are `sex`, `age`, `educ` and `work`. The outcome is the party chosen (`y`) while the alternative-specific is the distance between the voter's own political views to the party's position on the left-to-right spectrum (`distance`).

I interpret the negative sign for `distance` such that if the distance between individuals' own views and the position of the party on the left-right scale increases, on average individuals will tend to vote less for that party and more for the other options.

2.5 Extended Multinomial Logit

Table 3 presents estimation of regression model (3) but with the addition of respondents' own position on the left-right spectrum, i.e. `pa01`. `pa01` is coded as an ordered categorical variable with higher values signifying more right-leaning subjective political views.

More right-leaning views are associated with higher likelihood of voting for FDP and (even more) for AFD compared to CDU/CSU. This is unsurprising since AFD is the most right-leaning party and FDP is a free-market party (I believe without being an expert).

More left-leaning views makes it more likely to vote SPD and The Greens which are centrist-left and progressive, respectively. It makes it the most unlikely to vote for The Left which is the most left-leaning party so this is also unsurprising.

	(1)	
	y	
	SPD	GREENS
distance	-0.549*** (0.0292)	
MALE	0 (.)	0 (.)
FEMALE	0.0410 (0.135)	0.183 (0.145)
RESPONDENT: AGE	0.00257 (0.00428)	-0.00618 (0.00455)
NO CERTIFICATE	0 (.)	0 (.)
LOWEST LEVEL	0.263 (0.754)	-0.569 (0.785)
INTERMEDIARY LEVEL	0.194 (0.752)	0.00284 (0.774)
QUALI.UNIV.APPL.SCI.	0.205 (0.775)	0.280 (0.795)
QUALI.FOR UNIVERSITY	-0.00810 (0.753)	0.360 (0.772)
OTHER SCHOOL CERTIF.	-12.20 (706.3)	0.297 (2.015)
STILL AT SCHOOL	0.822 (1.060)	0.365 (1.146)
EMPLOYED, FULL-TIME	0 (.)	0 (.)
EMPLOYED, PART-TIME	-0.0274 (0.233)	0.0866 (0.219)
LESS THAN PART-TIME	0.870* (0.379)	0.849* (0.384)
NOT WORKING	0.155 (0.165)	-0.445* (0.176)
Constant	-0.926 (0.769)	-0.348 (0.789)
r2_p		
Standard errors in parentheses		
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$		

Table 2: Conditional Logit

		(1)				
	CDU_CSU	VOTING INTENTION: FEDERAL ELECTION				
		SPD	FDP	THE_GREENS	THE_LEFT	AFD
SELF-PLACEMENT ON LEFT-RIGHT CONTINUUM	1 (.)	0.831*** (0.0219)	1.051 (0.0419)	0.840*** (0.0232)	0.768*** (0.0216)	1.547*** (0.0727)
MALE	1 (.)	1 (.)	1 (.)	1 (.)	1 (.)	1 (.)
FEMALE	1 (.)	0.991 (0.118)	0.877 (0.133)	1.283 (0.163)	0.909 (0.139)	0.759 (0.129)
RESPONDENT: AGE	1 (.)	1.006 (0.00398)	1.000 (0.00499)	0.996 (0.00402)	0.993 (0.00461)	0.984** (0.00515)
NO CERTIFICATE	1 (.)	1 (.)	1 (.)	1 (.)	1 (.)	1 (.)
LOWEST LEVEL	1 (.)	1.819 (1.089)	1.565 (1.242)	0.835 (0.566)	0.487 (0.306)	4.063 (4.326)
INTERMEDIARY LEVEL	1 (.)	1.684 (1.005)	1.666 (1.314)	1.409 (0.942)	0.879 (0.539)	4.859 (5.157)
QUALI.UNIV.APPL.SCI.	1 (.)	1.904 (1.182)	2.970 (2.392)	2.272 (1.559)	0.897 (0.583)	3.307 (3.596)
QUALI.FOR UNIVERSITY	1 (.)	1.682 (1.006)	1.857 (1.465)	2.839 (1.890)	1.181 (0.721)	1.920 (2.054)
OTHER SCHOOL CERTIF.	1 (.)	0.000000741 (0.000519)	2.600 (3.636)	0.438 (0.639)	0.160 (0.250)	23.79* (33.04)
STILL AT SCHOOL	1 (.)	4.043 (3.606)	1.472 (2.038)	2.848 (2.803)	1.147 (1.147)	3.793 (5.283)
EMPLOYED, FULL-TIME	1 (.)	1 (.)	1 (.)	1 (.)	1 (.)	1 (.)
EMPLOYED, PART-TIME	1 (.)	0.967 (0.201)	0.714 (0.187)	1.154 (0.221)	0.724 (0.201)	0.735 (0.223)
LESS THAN PART-TIME	1 (.)	2.250* (0.742)	3.176*** (1.082)	2.161* (0.695)	3.131** (1.115)	2.246 (0.994)
NOT WORKING	1 (.)	1.100 (0.162)	0.511*** (0.0969)	0.680* (0.105)	1.183 (0.212)	0.801 (0.157)
r2_p	0.0716					

Exponentiated coefficients; Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 3: Extended Multinomial Logit

2.6 Nested Logit

The tree structure of the nested logit model is shown in Figure 7. The output from the regression is shown in Table 4.

type	N		pv01	N
left	3939	└─	SPD	1659
			THE GREENS	1458
			THE LEFT	822
right	3960	└─	CDU-CSU	2376
			FDP	840
			AFD	744
Total				7899

Figure 7: Nested Logit Tree Structure

	left	SPD	FDP	⁽¹⁾ y GREENS	LEFT	AFD	/type
SELF-PLACEMENT ON LEFT-RIGHT CONTINUUM	-1.06e-13 (.)						
MALE		0 (.)	0 (.)	0 (.)	0 (.)	0 (.)	
FEMALE		-0.0576 (94.46)	-0.143 (39.27)	0.184 (.)	-0.134 (124.5)	-0.541 (148.5)	
RESPONDENT: AGE		0.00814 (4.219)	0.0000365 (0.0116)	-0.00263 (.)	-0.00649 (1.511)	-0.0151 (4.138)	
NO CERTIFICATE		0 (.)	0 (.)	0 (.)	0 (.)	0 (.)	
LOWEST LEVEL		0.679 (.)	0.465 (127.7)	-0.134 (318.2)	-0.622 (509.1)	1.636 (449.2)	
INTERMEDIARY LEVEL		0.263 (238.6)	0.528 (145.0)	0.0979 (173.9)	-0.346 (.)	1.776 (487.7)	
QUALI.UNIV.APPL.SCI.		0.179 (80.04)	1.214 (333.4)	0.383 (.)	-0.580 (377.1)	1.327 (364.6)	
QUALI.FOR UNIVERSITY		-0.0795 (225.3)	0.635 (174.3)	0.496 (.)	-0.403 (352.1)	0.598 (164.4)	
OTHER SCHOOL CERTIF.		-37.33 (56828821.7)	0.820 (225.2)	1.238 (90.93)	1.470 (.)	2.958 (812.5)	
STILL AT SCHOOL		0.556 (166.3)	0.724 (198.7)	0.132 (.)	-0.725 (335.4)	1.551 (426.0)	
EMPLOYED, FULL-TIME		0 (.)	0 (.)	0 (.)	0 (.)	0 (.)	
EMPLOYED, PART-TIME		-0.0183 (.)	-0.400 (110.0)	0.201 (85.88)	-0.269 (98.31)	-0.335 (92.09)	
LESS THAN PART-TIME		-0.122 (168.0)	1.295 (355.6)	-0.131 (171.5)	0.307 (.)	0.787 (216.2)	
NOT WORKING		0.150 (39.59)	-0.783 (215.0)	-0.343 (232.5)	0.251 (.)	-0.276 (75.80)	
left_tau							1.081 (423.2)
right_tau							1.138 (312.6)
Constant		-1.452 (165.0)	-1.476 (405.4)	-1.031 (.)	-0.771 (101.6)	-1.635 (449.0)	
r2							
n							

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 4: Nested Logit

2.7 Experimentation

Due to the long run time of the `nlogit` command I have only been able to estimate a couple of multinomial logit models.

Table 5 Environmental protection sentiment is added as a regressor. It indicates the level of disagreement to whether environmental protection policies should be stricter. The results show that if a respondent disagrees they are more likely (compared to voting for CDU/CSU) to vote for

- FDP: I think FDP is a free-market party so I suppose it would make sense that environmentalists would favor other parties.
- AFD: I think this makes sense as the party is more conservative.

and less likely (relative to CDU/CSU) to vote for

- SPD: This makes sense, since it is the centre-left party.
- The Left: Unsurprising, since it is the most progressive party.
- Greens: Unsurprising, because even the party's name suggests that environmental policies are very important for this party.

Table 6 Immigrant sentiment is added as a regressor. It indicates the level of disagreement to whether immigrants are good for the German economy. The results show that if a respondent disagrees they are more likely (compared to voting for CDU/CSU) to vote for

- FDP: I do not have enough insider knowledge to evaluate if this makes sense.
- The Left: This is surprising given the progressive ideology of this party but the results are also not significant.
- AFD: This makes sense since the party is very anti-immigrant. The effect is highly significant as well.

and less likely (relative to CDU/CSU) to vote for

- SPD: Unsurprising, since it is the centre-left party.
- Greens: Unsurprising, since it is a progressive party.

Table 7 Newspaper Exposure is added as a regressor. It is a ordered variable indicating how many days a week a recipient reads the newspaper, i.e. $\in \{0, 1, \dots, 7\}$. Higher newspaper exposure is associated with less probability to vote for all other parties compared to CDU/CSU. However, the highest effects in magnitude are for The Left and AFD. This seems reasonable as they are the most extreme parties on the left-right spectrum. Thus, it would make sense that their voters read less newspapers (and perhaps get their news from e.g. Facebook instead). These effects are also the only ones that are statistically significant.

		(1)				
	CDU_CSU	VOTING INTENTION: FEDERAL ELECTION				
		SPD	FDP	THE_GREENS	THE_LEFT	AFD
MAKE ENVIRONMENTAL PROTECTION STRICTER	1 (.)	0.838** (0.0489)	1.030 (0.0709)	0.614*** (0.0418)	0.707*** (0.0540)	1.129 (0.0785)
MALE	1 (.)	1 (.)	1 (.)	1 (.)	1 (.)	1 (.)
FEMALE	1 (.)	1.029 (0.122)	0.875 (0.133)	1.249 (0.160)	0.936 (0.140)	0.628** (0.103)
RESPONDENT: AGE	1 (.)	1.006 (0.00397)	1.000 (0.00499)	0.997 (0.00405)	0.993 (0.00454)	0.985** (0.00493)
NO CERTIFICATE	1 (.)	1 (.)	1 (.)	1 (.)	1 (.)	1 (.)
LOWEST LEVEL	1 (.)	1.993 (1.192)	1.503 (1.190)	0.902 (0.616)	0.593 (0.367)	4.609 (4.891)
INTERMEDIARY LEVEL	1 (.)	1.865 (1.112)	1.577 (1.240)	1.550 (1.042)	1.044 (0.633)	5.119 (5.413)
QUALI.UNIV.APPL.SCI.	1 (.)	2.140 (1.327)	2.773 (2.226)	2.651 (1.831)	1.066 (0.686)	3.315 (3.588)
QUALI.FOR UNIVERSITY	1 (.)	1.917 (1.145)	1.724 (1.355)	3.238 (2.168)	1.421 (0.859)	1.781 (1.897)
OTHER SCHOOL CERTIF.	1 (.)	0.00000622 (0.00248)	2.049 (2.861)	1.493 (2.023)	1.389 (1.815)	14.86* (19.94)
STILL AT SCHOOL	1 (.)	4.508 (3.999)	1.381 (1.907)	3.262 (3.213)	1.394 (1.367)	4.035 (5.539)
EMPLOYED, FULL-TIME	1 (.)	1 (.)	1 (.)	1 (.)	1 (.)	1 (.)
EMPLOYED, PART-TIME	1 (.)	0.998 (0.206)	0.708 (0.185)	1.148 (0.221)	0.769 (0.209)	0.761 (0.223)
LESS THAN PART-TIME	1 (.)	2.393** (0.786)	3.073*** (1.044)	2.292** (0.737)	3.452*** (1.210)	1.893 (0.821)
NOT WORKING	1 (.)	1.105 (0.162)	0.510*** (0.0969)	0.660** (0.103)	1.182 (0.208)	0.781 (0.149)
r2_p	0.0467					

Exponentiated coefficients; Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 5: Same as Table 1 + Environmental Protection Sentiment

		(1)				
	CDU_CSU	VOTING INTENTION: FEDERAL ELECTION				
		SPD	FDP	THE_GREENS	THE_LEFT	AFD
IMMIGRANTS GOOD FOR GERMAN ECONOMY	1 (.)	0.954 (0.0283)	1.135* (0.0614)	0.901*** (0.0276)	1.027 (0.0466)	2.695*** (0.202)
MALE	1 (.)	1 (.)	1 (.)	1 (.)	1 (.)	1 (.)
FEMALE	1 (.)	1.072 (0.126)	0.866 (0.131)	1.375* (0.173)	1.012 (0.151)	0.614** (0.106)
RESPONDENT: AGE	1 (.)	1.005 (0.00394)	1.000 (0.00498)	0.995 (0.00399)	0.992 (0.00450)	0.984** (0.00534)
NO CERTIFICATE	1 (.)	1 (.)	1 (.)	1 (.)	1 (.)	1 (.)
LOWEST LEVEL	1 (.)	2.015 (1.208)	1.493 (1.182)	0.948 (0.653)	0.579 (0.357)	5.840 (6.345)
INTERMEDIARY LEVEL	1 (.)	1.866 (1.116)	1.612 (1.268)	1.607 (1.092)	1.022 (0.616)	8.818* (9.541)
QUALI.UNIV.APPL.SCI.	1 (.)	2.083 (1.295)	3.012 (2.420)	2.504 (1.746)	1.026 (0.657)	7.762 (8.606)
QUALI.FOR UNIVERSITY	1 (.)	1.894 (1.135)	1.851 (1.457)	3.218 (2.179)	1.400 (0.842)	4.818 (5.256)
OTHER SCHOOL CERTIF.	1 (.)	0.00000174 (0.00125)	2.144 (2.995)	1.100 (1.485)	1.092 (1.419)	24.74* (34.98)
STILL AT SCHOOL	1 (.)	4.408 (3.920)	1.623 (2.238)	3.040 (3.023)	1.388 (1.357)	12.13 (16.99)
EMPLOYED, FULL-TIME	1 (.)	1 (.)	1 (.)	1 (.)	1 (.)	1 (.)
EMPLOYED, PART-TIME	1 (.)	1.020 (0.210)	0.718 (0.188)	1.178 (0.225)	0.799 (0.217)	0.789 (0.244)
LESS THAN PART-TIME	1 (.)	2.363** (0.776)	3.159*** (1.074)	2.217* (0.710)	3.507*** (1.225)	2.417* (1.084)
NOT WORKING	1 (.)	1.114 (0.163)	0.519*** (0.0987)	0.670** (0.104)	1.229 (0.216)	0.927 (0.187)
r2_p	0.0660					

Exponentiated coefficients; Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 6: Same as Table 1 + Immigrant Sentiment

		(1)				
	CDU_CSU	VOTING INTENTION: FEDERAL ELECTION				
		SPD	FDP	THE_GREENS	THE_LEFT	AFD
NEWSPAPER: HOW MANY DAYS A WEEK	1 (.)	0.963 (0.0195)	0.960 (0.0246)	0.961 (0.0208)	0.922** (0.0240)	0.873*** (0.0243)
MALE	1 (.)	1 (.)	1 (.)	1 (.)	1 (.)	1 (.)
FEMALE	1 (.)	1.066 (0.125)	0.864 (0.130)	1.370* (0.173)	0.997 (0.149)	0.598** (0.0980)
RESPONDENT: AGE	1 (.)	1.008 (0.00414)	1.002 (0.00522)	0.998 (0.00421)	0.996 (0.00480)	0.993 (0.00528)
NO CERTIFICATE	1 (.)	1 (.)	1 (.)	1 (.)	1 (.)	1 (.)
LOWEST LEVEL	1 (.)	2.016 (1.204)	1.557 (1.234)	0.903 (0.612)	0.609 (0.376)	5.127 (5.459)
INTERMEDIARY LEVEL	1 (.)	1.897 (1.130)	1.645 (1.296)	1.564 (1.044)	1.087 (0.658)	5.851 (6.205)
QUALI.UNIV.APPL.SCI.	1 (.)	2.183 (1.353)	2.966 (2.387)	2.567 (1.762)	1.113 (0.715)	4.072 (4.419)
QUALI.FOR UNIVERSITY	1 (.)	1.976 (1.180)	1.825 (1.438)	3.275 (2.179)	1.517 (0.915)	2.146 (2.292)
OTHER SCHOOL CERTIF.	1 (.)	0.00000240 (0.00147)	2.194 (3.064)	1.174 (1.569)	1.198 (1.560)	19.12* (25.76)
STILL AT SCHOOL	1 (.)	4.619 (4.097)	1.458 (2.015)	3.211 (3.147)	1.449 (1.420)	4.627 (6.367)
EMPLOYED, FULL-TIME	1 (.)	1 (.)	1 (.)	1 (.)	1 (.)	1 (.)
EMPLOYED, PART-TIME	1 (.)	1.033 (0.213)	0.716 (0.187)	1.218 (0.232)	0.816 (0.221)	0.788 (0.232)
LESS THAN PART-TIME	1 (.)	2.401** (0.788)	3.074*** (1.044)	2.297** (0.733)	3.493*** (1.221)	1.874 (0.816)
NOT WORKING	1 (.)	1.133 (0.166)	0.510*** (0.0968)	0.696* (0.107)	1.237 (0.217)	0.801 (0.154)
r2_p	0.0397					

Exponentiated coefficients; Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 7: Same as Table 1 + Newspaper Exposure

A Appendix

Figure A1: Same as Figure 1 with Coefficients

vote	Coefficient	Std. err.	z	P> z	[95% conf. interval]	
sex						
FEMALE	-.2296355	.1618163	-1.42	0.156	-.5467896	.0875187
age	.0170574	.0047674	3.58	0.000	.0077136	.0264013
educ						
LOWEST LEVEL	.160226	.5620143	0.29	0.776	-.9413018	1.261754
INTERMEDIARY L..	.7804347	.5633977	1.39	0.166	-.3238045	1.884674
QUALI.UNIV.APP~.	1.667547	.6561889	2.54	0.011	.3814406	2.953654
QUALI.FOR UNIV..	1.360789	.5720244	2.38	0.017	.239642	2.481936
OTHER SCHOOL C..	-.7293452	.8673666	-0.84	0.400	-2.429352	.970662
STILL AT SCHOOL	0	(empty)				
work						
EMPLOYED, PART..	.2578936	.2850051	0.90	0.366	-.3007063	.8164934
LESS THAN PART..	-.0179192	.3719012	-0.05	0.962	-.7468322	.7109938
NOT WORKING	-.0568284	.1915465	-0.30	0.767	-.4322526	.3185958
_cons	1.068887	.5855008	1.83	0.068	-.0786734	2.216448

Figure A2: Same as Table 1 with Coefficients

pvalue	Coefficient	Std. err.	z	P> z	[95% conf. interval]	
CDU_CSU	(base outcome)					
SPD						
sex						
FEMALE	.0625443	.1175828	0.53	0.595	-.1679137	.2930022
age	.0047619	.0038305	1.24	0.214	-.0027457	.0122695
educ						
LOWEST LEVEL	.7315211	.5970741	1.23	0.221	-.4387226	1.901765
INTERMEDIARY LEVEL	.6617547	.5965215	1.11	0.267	-.5074059	1.830915
QUALI.UNIV.APPL.~.	.7845548	.6206777	1.26	0.206	-.431951	2.001061
QUALI.FOR UNIVER..	.701121	.5985645	1.17	0.241	-.4720439	1.874286
OTHER SCHOOL CER..	-12.85394	624.5142	-0.02	0.984	-1236.879	1211.171
STILL AT SCHOOL	1.510771	.8887966	1.70	0.089	-.2312383	3.252781
work						
EMPLOYED, PART-T..	.0261554	.2060951	0.13	0.899	-.3777836	.4300944
LESS THAN PART-T..	.8663442	.329037	2.63	0.008	.2214436	1.511245
NOT WORKING	.1306105	.1462052	0.89	0.372	-.1559464	.4171674
_cons	-1.444155	.6191866	-2.33	0.020	-2.657739	-.2305719
THE_GREENS						
sex						
FEMALE	.3294333	.1268016	2.60	0.009	.0809067	.5779599
age	-.0041662	.0039416	-1.06	0.291	-.0118917	.0035593
educ						
LOWEST LEVEL	-.1447634	.6791308	-0.21	0.831	-1.475835	1.186308
INTERMEDIARY LEVEL	.4132834	.6698914	0.62	0.537	-.8996797	1.726247
QUALI.UNIV.APPL.~.	.8909744	.6882867	1.29	0.195	-.4580427	2.239992
QUALI.FOR UNIVER..	1.130071	.6680331	1.69	0.091	-.1792498	2.439392
OTHER SCHOOL CER..	-.0963486	1.348891	-0.07	0.943	-2.740127	2.54743
STILL AT SCHOOL	1.081904	.9824079	1.10	0.271	-.8435801	3.007388
work						
EMPLOYED, PART-T..	.186845	.1916809	0.97	0.330	-.1888427	.5625328
LESS THAN PART-T..	.8771511	.3218785	2.73	0.006	.2462809	1.508021
NOT WORKING	-.3330982	.1545355	-2.16	0.031	-.6359822	-.0302141
_cons	-1.022095	.6875873	-1.49	0.137	-2.369741	.3255517