Female Labor Force Participation and the Big Five

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Background

- Personality traits, school attendance and school performance (e.g. Jacob (2002), Duckworth and Seligman (2005), Carneiro, Crawford, and Goodman (2007),...)
- Bowles, Gintis, and Osborne (2001):
  Personality traits are incentive enhancing
- Empirical Evidence:
  - USA: Carneiro and Heckman (2002), Heckman, Stixrud, and Urzua (2006), Mueller and Plug (2005)
  - Canada: Green and Riddell (2002)
  - Netherland: Nyhus and Pons (2005)
  - Sweden: Zetterberg (2005)
  - Germany: Flossmann, Piatek, and Wichert (2007)
- Borghans, Heckman, and Ter Weel (2008): Relationship between personality traits and preference parameters

Motivation

Analyze the role of noncognitive skills in the labor force participation decision

- Flossmann et al. (2007): Weak effect of noncognitive skills on wages for females
- Two channels possible: Direct effect through different preferences and indirect effect through wages
- Link to research on the intergenerational transmission of noncognitive skills: Employment patterns and child development

Outline

1. Introduction
2. The Big Five and Labor Force Participation
3. Empirical Approach
4. The Data
5. Empirical Results

Table: Description of the five main personality traits*

Extraversion:	Friendliness, Gregariousness, Assertiveness, Activity Level, Excitement-Seeking, Cheerfulness
Agreeableness:	Trust, Morality, Altruism, Cooperation, Modesty, Sympathy
Conscientiousness:	Self-Efficacy, Orderliness, Dutifulness, Achievement-Striving, Self-Discipline, Cautiousness
Neuroticism:	Anxiety, Anger, Depression, Self-Consciousness, Immoderation, Vulnerability
Openness:	Imagination, Artistic Interest, Emotionality, Adventurousness, Intellect, Liberalism

*Costa/McCrae (1992)

What do we expect?

The "score" of an individual on the Big Five traits matters in the decision about labor force participation

- Extraversion (e.g. excitement-seeking): $\oplus$
- Conscientiousness (e.g. achievement-striving, self-regulation): $\oplus$
- Openness to experience (e.g. intellect, liberalism): ???
- Neuroticism (e.g. anxiety): $\ominus$
- Agreeableness (e.g. cooperation, altruism): $\ominus$

First step: the Local Likelihood Logit Estimator

$$\hat{E}[Y|X=x] = \frac{1}{1+e^{-x'\hat{\theta}_x}}$$

With:

$$\hat{\theta}_x = argmax \sum_{i=1}^{n} (Y_i ln(\frac{1}{1+e^{-X_i'\theta_x}}) + (1-Y_i) ln(\frac{1}{1+e^{X_i'\theta_x}})) K_H(X_i - x)$$

where X can be continuous and / or discrete.

The Local Likelihood Logit Estimator (cont.)

The kernel weights are given by (Racine and Li, 2004):

$$K_{h,\delta,\lambda}(X_i - x) = \Pi_{q=1}^{q_1} \kappa(\frac{X_{q,i} - x_q}{h}) \Pi_{q=q_1+1}^{q_2} \delta^{|X_{q,i} - x_q|} \Pi_{q=q_2+1}^{Q} \lambda^{1(X_{q,i} \neq x_q)}$$

- q_1 regressors are continuous
- $q_1 + 1, \ldots, q_2$ discrete regressors with natural ordering
- $Q - q_2$ discrete regressors without natural ordering
- h, δ, λ: bandwidth parameters
- δ and λ control for the degree of smoothing

Second step: Structural Approach

Parallel preferences:

$$U_{it}(C_{it}, L_{it}) = G_{it}(C_{it} + V_{it}(L_{it}))$$

- Curvature of $G_{it}(\cdot)$: individual overall risk preference
- Curvature of $V_{it}(\cdot)$: preferences with respect to leisure
- $V_{it}(L_{it}) = \gamma_{it}(L^{\alpha_L} - 1)/\alpha_L$

Structural Approach (cont.)

Leisure function:

$$\ln L_{it} = -\frac{\ln \gamma_{it}}{\alpha_L - 1} + \frac{1}{\alpha_L - 1} \ln W_{it}.$$

$$\ln \gamma_{it} = \gamma_0 + \gamma_z Z_{it} + \gamma_p \ln P_{it} + \gamma_{zz} Z_{it}^2 + \gamma_{pp} (\ln P_{it})^2 + \gamma_{zp} Z_{it} \ln P_{it} + \nu_{it},$$

with P_{it}: personal traits, Z_{it}: socio-economic factors

Our Sample

- Taken from the 2005 wave of the GSOEP
- Females aged from 25 to 54
- Either married or living together with their partner
- Information about the partner in the sample
- Sample size: 2,800 women
- Dependent variable: "employed", either part-time or full-time

Descriptive Statistics

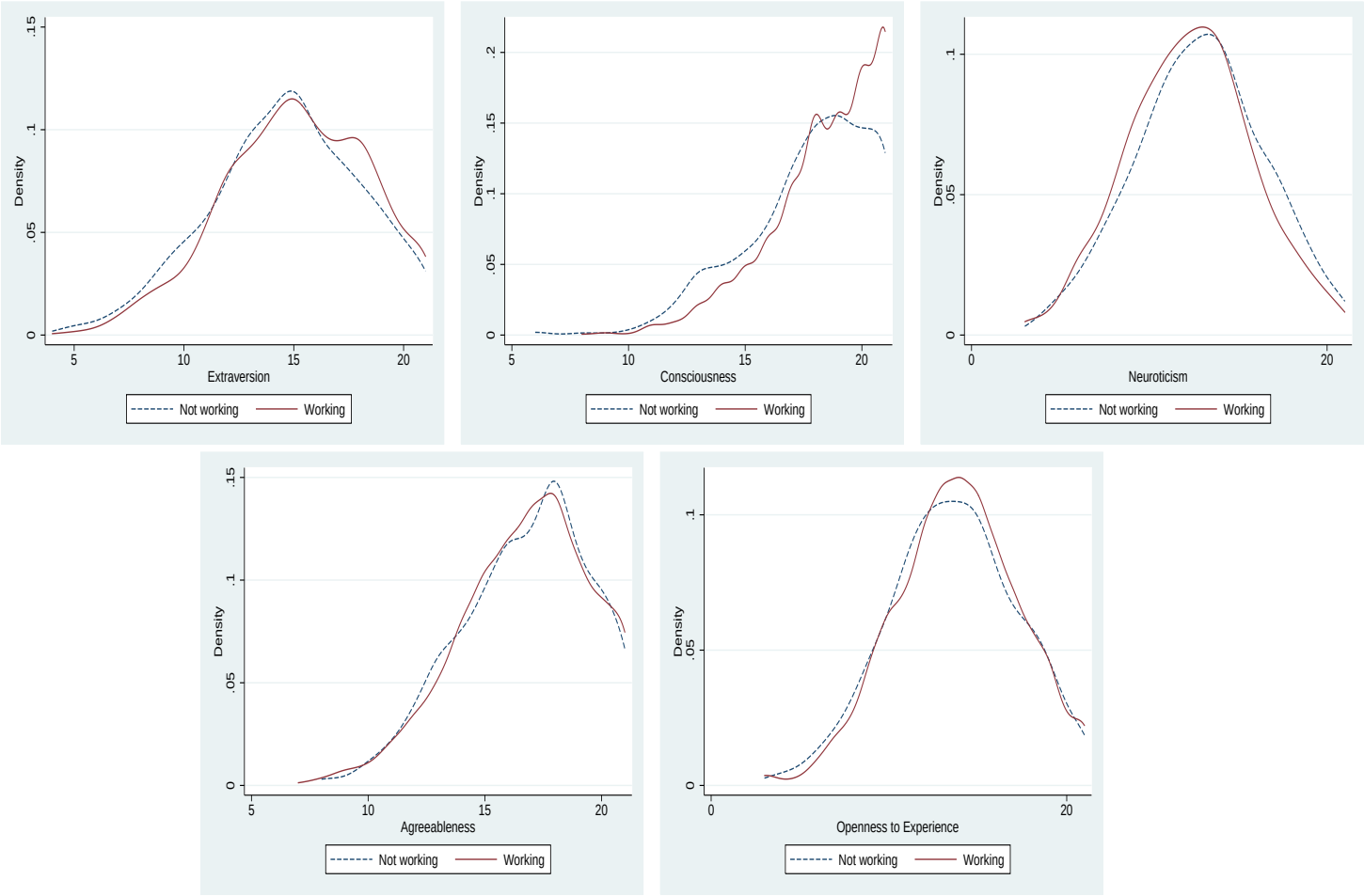
Variable	Employed Mean	Employed Std. Dev.	Not working Mean	Not working Std. Dev.
AGE	42.18	8.02	40.92	8.32
GERMAN	0.94	0.23	0.88	0.33
EAST	0.24	0.43	0.20	0.40
FULLTIME	0.54	0.50	0	0
PARTTIME	0.46	0.50	0	0
logWAGE	6.98	0.56	1.29	2.39
HOUR_WAGE	8.55	4.21	1.57	3.81
logHH_INC	5.24	3.48	5.13	3.57
BABY_TODDLER	0.09	0.28	0.29	0.45
STUDENT	0.34	0.47	0.44	0.50
REAL	0.50	0.50	0.47	0.50
HIGHSCHOOL	0.29	0.45	0.20	0.40
VOCATIONAL	0.75	0.43	0.70	0.46
UNI	0.20	0.40	0.12	0.32
EDUC_PARTNER	2.47	1.39	3.37	1.41
PAR_HOME	0.11	0.31	0.11	0.31
PAR_CITY	0.41	0.49	0.39	0.49
NOT_SATISFIED	0.07	0.26	0.11	0.31
NEU	12.31	3.54	12.86	3.65
EXT	15.11	3.32	14.66	3.44
OPEN	13.82	3.50	13.61	3.61
AGREE	16.73	2.79	16.72	2.76
CONSC	18.45	2.34	17.75	2.67
BigFiveIndex	51.80	9.02	49.90	9.16
Rotter05	24.14	5.51	22.32	6.10
Number of obs.	1,777		1,023	

How are the Big Five measured?

"I see myself as someone who ...

- **Extraversion**: ... is communicative, talkative (+); is outgoing, sociable (+); is reserved (-)
- **Conscientiousness**: ... does a thorough job (+); does things effectively and efficiently (+); tends to be lazy (-)
- **Neuroticism**: ... is relaxed, handles stress well (-); gets nervous easily (+); worries a lot (+)
- **Agreeableness**: ... has a forgiving nature (+); is considerate and kind to others (+); is sometimes somewhat rude to others (-)
- **Openness**: ... is original, comes up with new ideas (+); has an active imagination (+); values artistic experiences (+)

The Big Five in our Sample



Extraversion, Consciousness, Neuroticism
Agreeableness, Openness to experience

The wage equation

Variable	with Big Five	without Big Five	with Big Five	without Education	Big Five Index
	2005		2006	2005	2005
EAST	-0.1914	-0.1953	-0.1859	-0.1763	-0.1957
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
AGE	0.0346	0.0361	0.0328	0.0308	0.0364
	(0.00)	(0.00)	(0.01)	(0.02)	(0.00)
AGE_SQ	-0.0003	-0.0004	-0.0003	-0.0003	-0.004
	(0.02)	(0.01)	(0.03)	(0.05)	(0.01)
GERMAN	0.1269	0.1257	0.1171	0.1978	0.1257
	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)
PARTTIME	-0.0530	-0.0563	-0.0534	-0.0943	-0.0563
	(0.01)	(0.00)	(0.01)	(0.00)	(0.00)
REAL	0.1150	0.1177	0.1224		0.1179
	(0.00)	(0.00)	(0.00)		(0.00)
HIGHSCHOOL	0.3031	0.3089	0.2993		0.3091
	(0.00)	(0.00)	(0.00)		(0.00)
VOCATIONAL	-0.0130	-0.0117	-0.0206		-0.0113
	(0.60)	(0.64)	(0.41)		(0.65)
UNI	0.1824	0.1856	0.1820		0.1862
	(0.00)	(0.00)	(0.00)		(0.00)
CONST	1.2436	0.9695	1.3431	1.605	0.9902
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
CONSC (2005)	-0.0034		-0.0022	-0.0121	
	(0.41)		(0.60)	(0.01)	
OPEN (2005)	0.0006		0.0006	0.0071	
	(0.84)		(0.84)	(0.02)	
EXT (2005)	-0.0012		-0.0040	-0.0031	
	(0.70)		(0.19)	(0.35)	
AGREE (2005)	-0.0066		-0.0072	-0.0072	
	(0.05)		(0.03)	(0.05)	
NEU (2005)	-0.0050		-0.0066	-0.0079	
	(0.05)		(0.01)	(0.01)	
Big Five Index (2005)					-0.0005
					(0.59)
Nobs.	1,777	1,777	1,791	1,777	1,777
$Adj.R^2$	0.2091	0.2012	0.1965	0.0666	0.2009
$F_{(5,1762)}$, $F_{(5,1776)}$	1.71		2.41	4.98	

Table 4: Estimates of Wage Equation

Variable	with Big Five	without Big Five	with Big Five	without Education	Big Five Index
	2005		2006	2005	2005
EAST	-0.1914	-0.1953	-0.1859	-0.1763	-0.1957
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
AGE	0.0346	0.0361	0.0328	0.0308	0.0364
	(0.00)	(0.00)	(0.01)	(0.02)	(0.00)
AGE_SQ	-0.0003	-0.0004	-0.0003	-0.0003	-0.004
	(0.02)	(0.01)	(0.03)	(0.05)	(0.01)
GERMAN	0.1269	0.1257	0.1171	0.1978	0.1257
	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)
PARTTIME	-0.0530	-0.0563	-0.0534	-0.0943	-0.0563
	(0.01)	(0.00)	(0.01)	(0.00)	(0.00)
REAL	0.1150	0.1177	0.1224		0.1179
	(0.00)	(0.00)	(0.00)		(0.00)
HIGHSCHOOL	0.3031	0.3089	0.2993		0.3091
	(0.00)	(0.00)	(0.00)		(0.00)
VOCATIONAL	-0.0130	-0.0117	-0.0206		-0.0113
	(0.60)	(0.64)	(0.41)		(0.65)
UNI	0.1824	0.1856	0.1820		0.1862
	(0.00)	(0.00)	(0.00)		(0.00)
CONST	1.2436	0.9695	1.3431	1.605	0.9902
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
CONSC (2005)	-0.0034		-0.0022	-0.0121	
	(0.41)		(0.60)	(0.01)	
OPEN (2005)	0.0006		0.0006	0.0071	
	(0.84)		(0.84)	(0.02)	
EXT (2005)	-0.0012		-0.0040	-0.0031	
	(0.70)		(0.19)	(0.35)	
AGREE (2005)	-0.0066		-0.0072	-0.0072	
	(0.05)		(0.03)	(0.05)	
NEU (2005)	-0.0050		-0.0066	-0.0079	
	(0.05)		(0.01)	(0.01)	
Big Five Index (2005)					-0.0005
					(0.59)
Nobs.	1,777	1,777	1,791	1,777	1,777
$Adj.R^2$	0.2091	0.2012	0.1965	0.0666	0.2009
$F_{(5,1762)}$, $F_{(5,1776)}$	1.71		2.41	4.98	

Wage equation with selection

Variable	without Big Five	with Big Five	without education	with Big Five	Big Five Index
	2005		2005	2006	2005
EAST	-0.2107	-0.2127	-0.1454	-0.2013	-0.2126
	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)
AGE	0.0205	0.0187	0.0122	0.0227	0.0201
	(0.08)	(0.11)	(0.32)	(0.06)	(0.09)
AGE_SQ	-0.0002	-0.0001	-0.0001	-0.0002	-0.0002
	(0.25)	(0.31)	(0.55)	(0.18)	(0.26)
GERMAN	0.1331	0.1369	0.1932	0.129	0.1336
	(0.02)	(0.02)	(0.00)	(0.02)	(0.02)
PARTTIME	-0.008	-0.0054	-0.0291	-0.0122	-0.0083
	(0.69)	(0.79)	(0.17)	(0.53)	(0.68)
REAL	0.136	0.1341		0.132	0.1358
	(0.00)	(0.00)		(0.00)	(0.00)
HIGHSCHOOL	.3254	0.3228		0.3149	0.3252
	(0.00)	(0.00)		(0.00)	(0.00)
VOCATIONAL	0.0148	0.0147		0.0009	0.0146
	(0.60)	(0.60)		(0.97)	(0.61)
UNI	0.2162	0.2135		0.2071	0.2158
	(0.00)	(0.00)		(0.00)	(0.00)
CONST	1.1571	1.2863	1.8015	1.2792	1.1309
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
CONSC (2005)		0.0018	-0.0076	0.0021	
		(0.71)	(0.14)	(0.65)	
OPEN (2005)		0.0016	0.0095	0.0021	
		(0.59)	(0.00)	(0.48)	
EXT (2005)		-0.0016	-0.0046	-0.0038	
		(0.64)	(0.23)	(0.27)	
AGREE (2005)		-0.0043	-0.0043	-0.0038	
		(0.24)	(0.29)	(0.28)	
NEU (2005)		-0.0049	-0.0076	-0.0065	
		(0.07)	(0.01)	(0.02)	
Big Five Index (2005)					0.0006
					(0.58)
λ	0.0398	0.0483	-0.0074	0.0415	0.0422
	(0.08)	(0.05)	(0.90)	(0.06)	(0.05)
Nobs.	2,800	2,800	2,800	2,794	2,800
log Pseudolik	-2,640.653	-2,638.486	2,776.912	-2,617.965	-2,640.496

The selection equation

Variable	Selection equation	
	Coefficient	(p-value)
EAST	-0.0345	(0.58)
AGE	0.0142	(0.00)
GERMAN	0.1796	(0.07)
logHH_INC	0.0259	(0.01)
EDUCATION	0.1643	(0.00)
EDUC_PARTNER	-0.0366	(0.13)
BABY_TODD	-1.1331	(0.00)
STUDENT	-0.2228	(0.00)
NOT_SATISFIED	0.1233	(0.19)
PAR_HOME	0.1261	(0.16)
PAR_CITY	0.0459	(0.41)
CONST	0.1882	(0.57)
CONSC (2005)	0.119	(0.00)
OPEN (2005)	-0.026	(0.05)
EXT (2005)	0.026	(0.06)
AGREE (2005)	-0.028	(0.09)
NEU (2005)	-0.035	(0.00)
Nobs.	2,800	
Censored obs.	802	

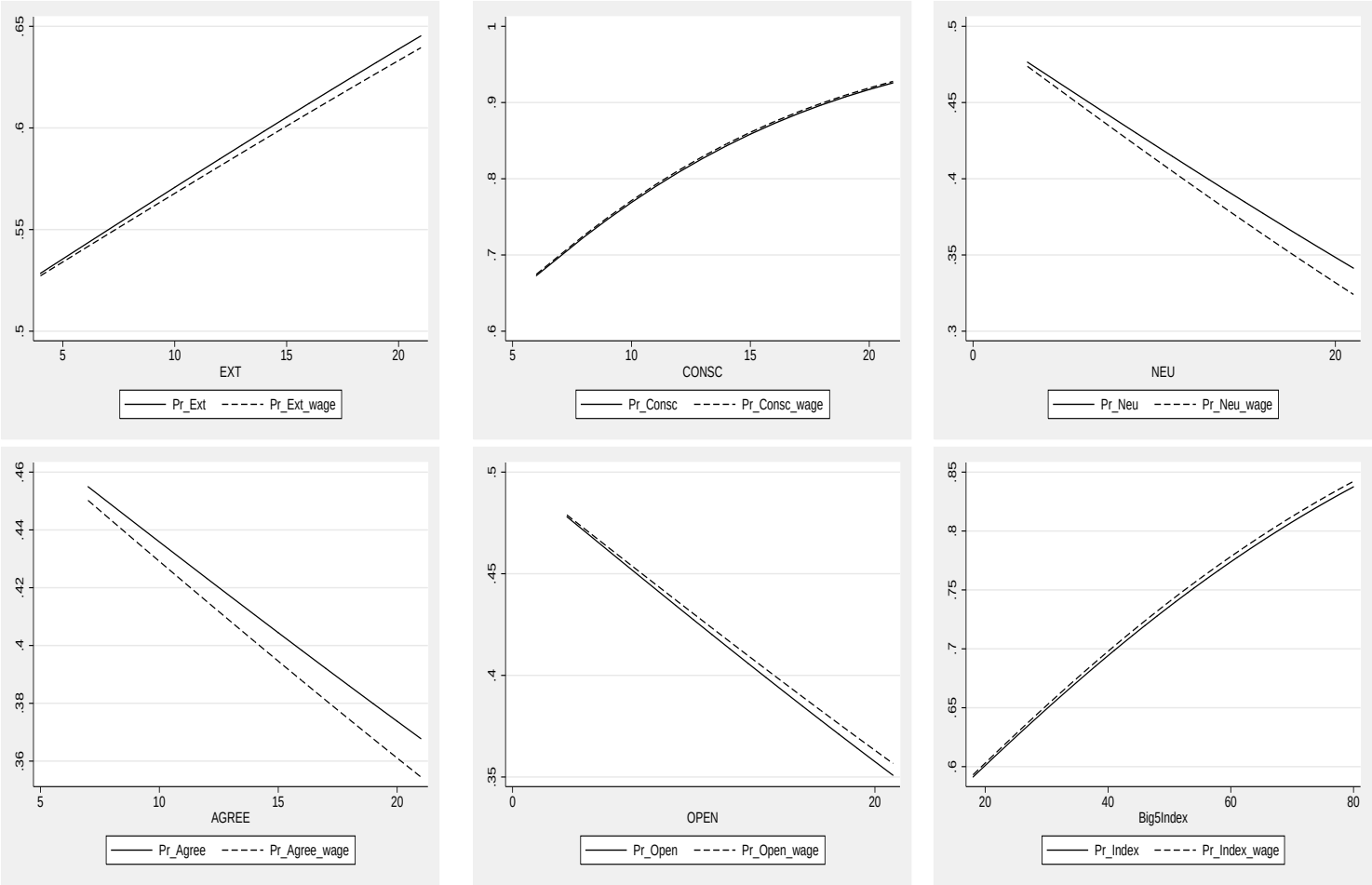
The participation equation

Variable	with Big 5	with Index	without Big 5	without log wage
logHOUR_WAGE	0.7549	0.7165	0.7212	
	(0.00)	(0.00)	(0.00)	
EAST	0.1768	0.1779	0.2186	0.0522
	(0.36)	(0.36)	(0.26)	(0.79)
AGE	0.1152	0.1408	0.1531	0.1311
	(0.06)	(0.02)	(0.01)	(0.03)
AGE_SQ	-0.0018	-0.0020	-0.0022	-0.0019
	(0.02)	(0.01)	(0.00)	(0.01)
GERMAN	0.4025	0.3743	0.3697	0.4721
	(0.01)	(0.02)	(0.02)	(0.00)
EDUCATION	0.2149	0.2062	0.2270	0.2782
	(0.00)	(0.00)	(0.00)	(0.00)
EDUC_PARTNER	0.0081	0.0051	0.0040	0.0066
	(0.80)	(0.87)	(0.90)	(0.83)
BABY_TODD	-1.8878	-1.8741	-1.8673	-1.8378
	(0.00)	(0.00)	(0.00)	(0.00)
STUDENT	-0.7212	-0.7094	-0.7127	-0.7198
	(0.00)	(0.00)	(0.00)	(0.00)
CONST	-4.5347	-4.6355	-3.8630	-3.4411
	(0.00)	(0.00)	(0.00)	(0.01)
CONSC (2005)	0.1202			0.1154
	(0.00)			(0.00)
OPEN (2005)	-0.0293			-0.0247
	(0.03)			(0.00)
EXT (2005)	0.0285			0.0255
	(0.04)			(0.07)
AGREE (2005)	-0.0258			-0.0298
	(0.12)			(0.07)
NEU (2005)	-0.0313			-0.0366
	(0.01)			(0.00)
Big Five Index		0.0205		
(2005)		(0.00)		
Nobs.	2,800	2,800	2,800	2,800
McFadden's R^2	0.1195	0.1078	0.1026	0.1105
log Lik	-1,618.4353	-1,639.7977	-1,649.4098	-1,634.9742

Table 6: Estimates of the Structural Participation Equation

Variable	with Big 5	with Index	without Big 5	without log wage
logHOUR_WAGE	0.7549	0.7165	0.7212	
	(0.00)	(0.00)	(0.00)	
EAST	0.1768	0.1779	0.2186	0.0522
	(0.36)	(0.36)	(0.26)	(0.79)
AGE	0.1152	0.1408	0.1531	0.1311
	(0.06)	(0.02)	(0.01)	(0.03)
AGE_SQ	-0.0018	-0.0020	-0.0022	-0.0019
	(0.02)	(0.01)	(0.00)	(0.01)
GERMAN	0.4025	0.3743	0.3697	0.4721
	(0.01)	(0.02)	(0.02)	(0.00)
EDUCATION	0.2149	0.2062	0.2270	0.2782
	(0.00)	(0.00)	(0.00)	(0.00)
EDUC_PARTNER	0.0081	0.0051	0.0040	0.0066
	(0.80)	(0.87)	(0.90)	(0.83)
BABY_TODD	-1.8878	-1.8741	-1.8673	-1.8378
	(0.00)	(0.00)	(0.00)	(0.00)
STUDENT	-0.7212	-0.7094	-0.7127	-0.7198
	(0.00)	(0.00)	(0.00)	(0.00)
CONST	-4.5347	-4.6355	-3.8630	-3.4411
	(0.00)	(0.00)	(0.00)	(0.01)
CONSC (2005)	0.1202			0.1154
	(0.00)			(0.00)
OPEN (2005)	-0.0293			-0.0247
	(0.03)			(0.00)
EXT (2005)	0.0285			0.0255
	(0.04)			(0.07)
AGREE (2005)	-0.0258			-0.0298
	(0.12)			(0.07)
NEU (2005)	-0.0313			-0.0366
	(0.01)			(0.00)
Big Five Index		0.0205		
(2005)		(0.00)		
Nobs.	2,800	2,800	2,800	2,800
McFadden's R^2	0.1195	0.1078	0.1026	**?**
log Lik	-1,618.4353	-1,639.7977	-1,649.4098	**?**

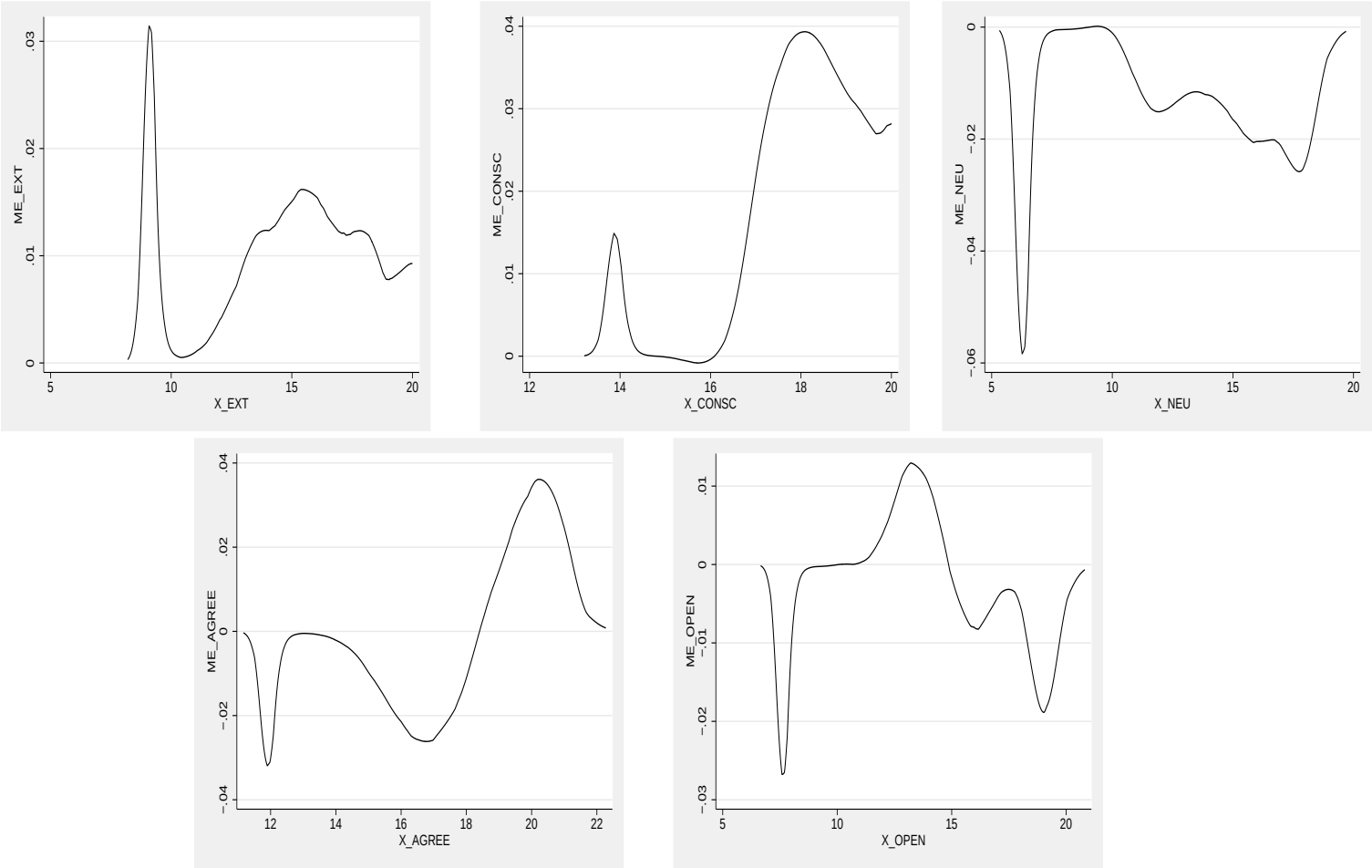
Direct and indirect effects



Extraversion, Consciousness, Neuroticism

Agreeableness, Openness to experience, Big 5 Index

Local Logit Results: Marginal effects



Extraversion, Consciousness, Neuroticism
Agreeableness, Openness to experience

Distribution of the marginal effects:

	CONSC	OPEN	EXT	AGREE	NEU
	Logit estimates				
Mean	1.06	-0.70	0.68	-0.61	-0.75
$Q_{0.05}$	0.78	-0.72	0.65	-0.63	-0.77
$Q_{0.25}$	0.87	-0.71	0.67	-0.62	-0.76
$Q_{0.50}$	0.96	-0.70	0.68	-0.61	-0.75
$Q_{0.75}$	1.17	-0.69	0.69	-0.61	-0.74
$Q_{0.95}$	1.65	-0.68	0.70	-0.60	-0.71
	Local Logit estimates				
Mean	1.989	-0.260	0.916	-0.127	-1.269
$Q_{0.05}$	-0.055	-1.837	0.063	-2.604	-2.690
$Q_{0.25}$	0.177	-0.680	0.360	-1.597	-1.946
$Q_{0.50}$	2.701	-0.145	0.922	-0.196	-1.234
$Q_{0.75}$	3.432	0.065	1.259	0.833	-0.230
$Q_{0.95}$	3.932	1.120	1.618	3.605	0.006

Major Findings

- Big Five are important determinants of labor supply decision
- Except for Agreeableness (p=12%) all factors matter !
- Role of Big Five for wage determination is limited
- Results are rather robust

Caveats/Outlook

- more elaborate preference function
- labor supply instead of labor force participation
- causality, instruments, GMM and all that
- factor model

Thanks for your attention!