The Effects of Student Aid - Evidence from Germany

DRAFT - Master's Thesis
in Economics (Science Track)

by

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https://github.com/VARFynn/University_Contributions/tree/main/01_Master/01_Masterthesis/01_Masterthesis.pdf

GitHub

Abstract

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DISCLAIMER: *AI (ChatGPT & DeepL) was used in the following ways: (1) to identify grammatical and typographical errors (ex-post; chapter wise, AI identifies weaknesses & I manually correct), and (2) to suggest synonyms for in my view not-fitting words or phrases (while writing; only sentence fragments chosen by myself).*

Acknowledgement

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1 Introduction

RQ1: *What are the costs associated with BAfoeG, and how do are the effects on the decisions to start studies, complete studies, and supplying labor during the studies? (What factors influence the likelihood of taking up or not taking up BAfoeG? see Kalinovski Herber (2016) paper with comparable SOEP approach)*

RQ2: *How does this differ between certain (marginalized) subgroups; First-Gen, certain income classes ...*

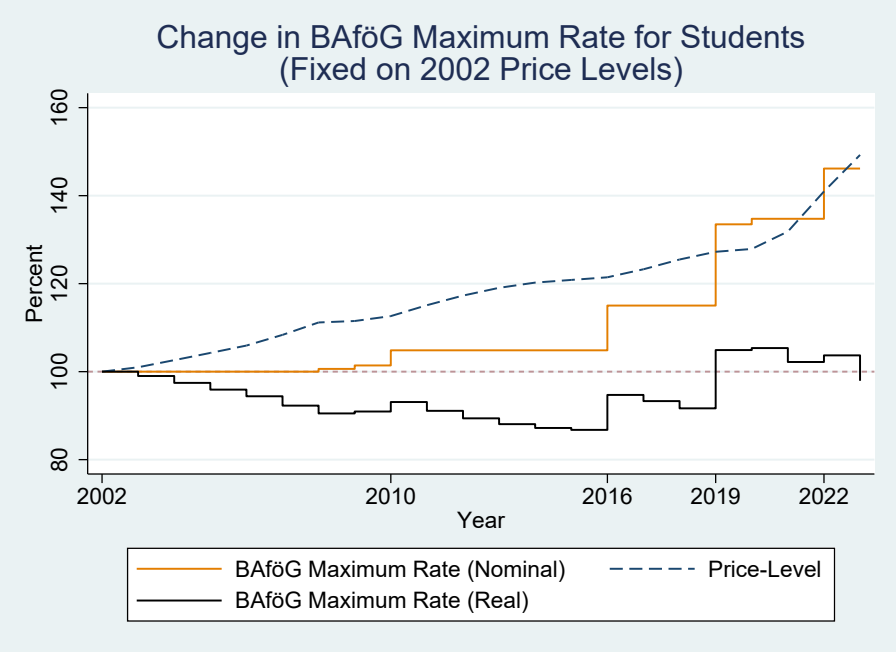
Relevant Literature:

- Welfare State Intro: Several Paper from Torben
- Study Grants: Several Paper from Elena
- SOEP/Germany Specific Pre-Literature:

2 Theoretical Framework

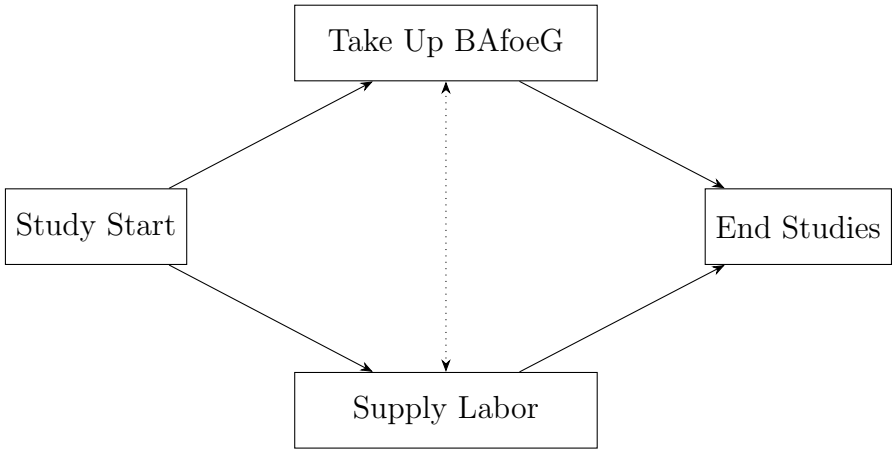
2.1 BAfoeG in Germany

- **Means-Based Testing**: Explaining the "Calculation Algorithm".
- **Algorithm Overview:** Brief explanation highlighting the essential parameters. (Create Table of Parameters in Appendix)
- **Parameter Modifications & Policy Reforms:** Real vs. nominal changes.



Change also holds for other parameters

2.2 The Student's Decisions



1. Decision to enter the state: Study vs. Work

2. Deicision to leave state: (i) Ability to finish program &

3 Data and Descriptive Statistics

- SOEP ⇒
- Data Cleaning
  - Starting with 2002, because prior too many "filler students". Year y $\in [2002, 2019]$ ⇒ pre Covid.
  - Imputations (e.g. Heckman correction for missing wages in specific waves) ⇒ Optimal Behavior e.g. "Steuerklassen"
  - Discussion: Left- & Right-censored students & Students without Parents in Sample (*provide summary in apendix that no difference between two groups*)
  - Tax Estimation

Table 1: Summary Statistics Students (2002-2019)

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
Individual Characteristics:					
Age	12589	23.5436	3.2963	17	35
Male	12589	.4799	.4996	0	1
HH with Parents	12589	.4273	.4947	0	1
Migration Background	12589	.2273	.4191	0	1
First Gen	12589	.3395	.4736	0	1
Academic:					
University	12589	.7283	.4448	0	1
Polytechnic	12589	.2332	.4229	0	1
Work Academy	12589	.0274	.1633	0	1
Year in University	12589	3.3196	2.3323	1	16
Income:					
Inc. Student (€, Gross, Mth.)	12589	506.285	690.0756	0	3000
Labor Supply	12589	.4902	.4999	0	1
Labor Supply (Weekly Hours)	6171	20.3635	12.6687	1	40
Inc. Father (€, Gross, Mth.)	12589	4068.4187	5151.7772	0	92317.5
Inc. Mother (€, Gross, Mth.)	12589	1785.1596	2277.5304	0	72000
BAfoeG:					
Student Grants (SOEP)	12589	.2361	.4247	0	1
Student Grants (€, Mth.)	2151	430.0014	236.917	10	3000
BAfoeG (simulated)	12589	.3246	.4682	0	1
BAfoeG (€, Mth.)	4086	360.05	206.1949	10.3133	2599
Eligible for BAfoeG	12589	.8988	.3016	0	1

Note: This includes every individual who studied for at least one semester in the respective year. Consequently, individuals appearing in j study years influence the mean with a weighting of j/n. Student Grants include state funding (BAfoeG) as well as other forms of stipends. BAfoeG amounts are calculated under the assumption of optimal behavior and always assume an application is made if the amount is greater than zero. Therefore, these figures may be higher than the actual amounts received.

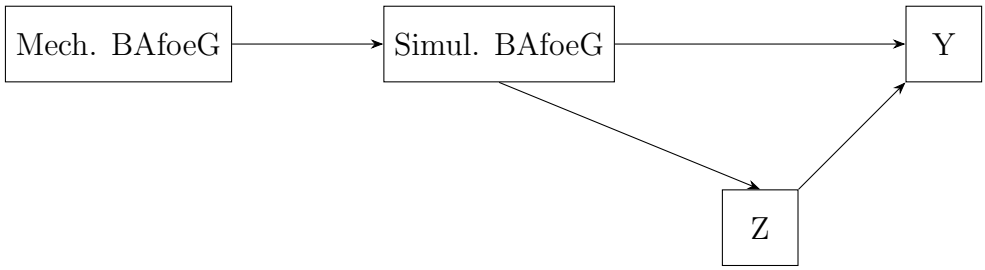
- BAfoeG Simulated vs. Actual
  - See for Share actual vs. simulated details per year
  - Discussion where difference might stem from (totally in line with "offical estimates" (from Fraunhofer FIT in official BAF Statistik [**include proper citation in BibTex**])
  - Discussion Approach
- Differences other papers, e.g. Kalinovski Herber 2016 or
  - Many just took Student Grant variable = BAFoeG, which is not correct
  - HH with parents too high (SOEP specific reporting & Living place vs. official place of residency aka specific variables vs. hid)

4 Empirical Framework

The Game-Plan:

1. Plain Cost Estimation
   (a) Estimate the costs of BAfoeG per Year ⇒ suppose an Income-Tax-Change to finance this costs ⇒ take ε from the Literature ⇒ End up with Monetary + Lapor Supply Costs
2. Effects Real BAfoeG Variation
   (a) Decision to start study (first. post. sec. degree)
      - General
      - Only Students which qualify for BAfoeG (Probit/OLS - LPM)
      - Share First Generation Students
      - FH & Technical
   (b) Decision to end study in planned time [1]
   (c) Decision to provide labor while studying (Reference to positive effects Mattana & Joensen) - both extensive & intensive margin
   (d) Take up & Non-Take-UP
      - Income Groups who drop out due to real wage inadjustment
3. Controls/Robustness:
   - Robustness-Check: Average Wage (Inflation Variation might not fully relfecting Real Wage Variance)
   - Robustness-Check: Financial Crisis 2008 (2018) similar argument as above (+ US argument of choosing edu in crisis; might not hold for risk averse Germany with inversely observed effects).
   - Robustness-Check: Grant & Loan Share (can be calc. using sim BAF), see argument Elena Mattana & Juana Joensen: *"find that if study aid consists mostly of grants, a reduction in loans and increase in grants reduces graduation rates. However, once loans are larger than grants, further changes have little impact on dropout and graduation rates. This means that once aid is mostly provided as loans, the government can decide who bears the college cost without affecting human capital accumulation"*
   - Only for LS & TAKE-UP: Hochschultyp (internal FIT Argument that differences in BAF Behavior, Takeup between Uni type)
   - Brutto t-1 (t-1, since t flawed for students who chose to study; proxy for outside option)

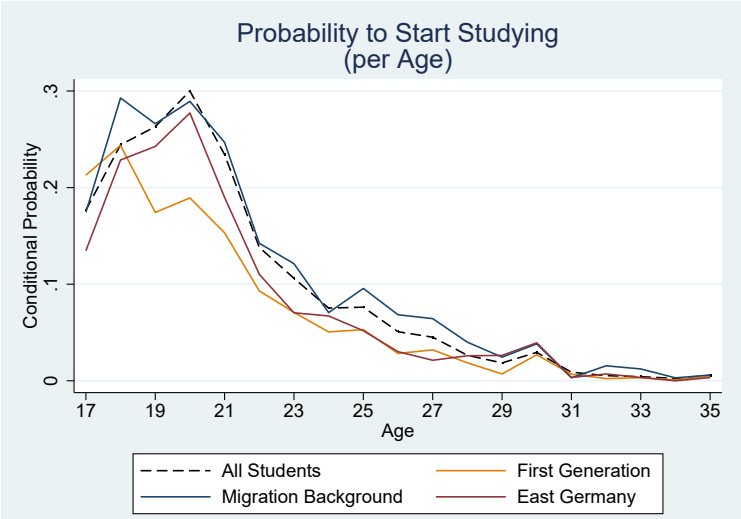
[1] Still open, if panel structure allows to validly access this.

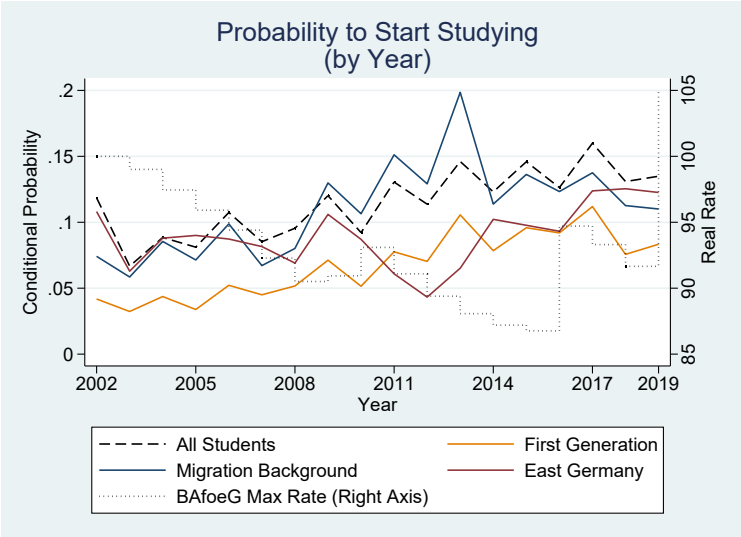


4.1 Costs

4.2 Effects

(a) Ω = all i with age $\leq$ 35, qualifying highschool degree, no student, no degree + respective first year students ($\Rightarrow$ obv. result unbalanced panel - **Does this yield any unwanted bias?**)





General Pooled Regression - (Naíve Pre Reg) $\Rightarrow$ Using Real BAfoeG Max Rate as Treatment (No Effect expected)

$$PR_{it}(\text{Begin} \mid \text{Eligble}) = \beta_0 + \beta_1 \times \text{BAfoeG Max Rate}_t + W'\zeta + \varepsilon_{it} \tag{1}$$

$W'\zeta$ = Matrix Controls

Problem: Unobserved Heterogeneity ⇒ LPM + FE **(Add Appendix Table where we see non-difference between Probit & LPM)**

$$PR_{it}(\text{Begin} \mid \text{Eligble}) = \beta_0 + \beta_1 \times \text{BAfoeG Max Rate}_t + W'\zeta + u_i + \varepsilon_{it} \tag{2}$$

u_i = i FE

Problem: Not everyone receives treatment.[2] With Simulated individual specific Data ⇒ allows to (i) determine who would have received BAfoeG & (ii) use mechanical BAfoeG variation (simulated) unconditional on working decision:

(i) Simulated Treatment ⇒ s = 1; s = 0 ⇒ BAfoeG Max Rate = 0

$$PR_{ist}(\text{Begin} \mid \text{Eligble}) = \beta_0 + \beta_1 \times \text{BAfoeG Max Rate}_{st} + W'\zeta + u_i + \varepsilon_{ist} \tag{3}$$

(ii) Mechanical BAfoeG Variation (w/o own Income Restriction)

$$PR_{ist}(\text{Begin} \mid \text{Eligble}) = \beta_0 + \beta_1 \times \text{Sim. BAfoeG}_{ist} + W'\zeta + u_i + \varepsilon_{ist} \tag{4}$$

Following regressions with similar setup. Also possible to use the variation in grant rate (vs loan).

(b) Unclear

(c) student body simple

(d)

NTU -¿ see Kalinowski & Herber :

$$NTU = \frac{SE - (BAF|SE)}{SE} = \frac{\overline{BAF}|SE}{SE} \tag{5}$$

Argument made in K & Beta Error Rate:

$$\beta = \frac{BAF|\overline{SE}}{BAF} \tag{6}$$

Consequently, as often made in Literature, Lower Bound

$$NTU_{LB} = \frac{\overline{BAF}|SE}{SE} \tag{7}$$

[2]Actually, one could argue that current missperception of BAfoeG in the public the treated are only those, who think they receive BAfoeG. ⇒ Limitations.

5 Results

5.1 Costs

5.2 Effects

5.2.1 Study Start

(Probably in APPENDIX:)
We see only minor difference between probit und LPM.

Table 2: Study Start: Pooled OLS & Probit - Max. Rate

	(1)		(2)
PR(Study Start)	Probit	dydx	OLS
Real BAfoeG (Max. Rate)	-.0021	-.0004	-.0004
	(.0024)	(.0004)	(.0004)
First Generation	-.6151***	-.1028***	-.1231***
	(.0237)	(.0039)	(.0051)
Migration Background	-.0349	-.0058	-.0048
	(.0269)	(.0045)	(.0048)
East Germany	-.3191***	-.0533***	-.0631***
	(.0306)	(.0051)	(.005)
Gross Income T-1 (Main Job)	-.0005***	-.0001***	-.0001***
	(0)	(0)	(0)
N	28811		28811
R^2			.0992
Pseudo-R^2	.1562		
RMSE			.3000
Wald Chi^2	1847.82		

Cluster Robust Std. Errors in Parantheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Note:

Using Max. Rate as Treatment:

Table 3: Study Start: FE - Max. Rate BAfoeG

PR(Study Start)	(1)	(2)	(3)	(4)	(5)
Real BAfoeG (Max. Rate)	.001**	.0006	.0014**	.0014**	.0014**
	(.0004)	(.0004)	(.0006)	(.0006)	(.0006)
Real BAfoeG (Max. Rate) × First Generation			-.0005	-.0005	-.0005
			(.0003)	(.0003)	(.0003)
Real BAfoeG (Max. Rate) × Migration Background			-.0015*	-.0015*	-.0015*
			(.0009)	(.0009)	(.0009)
Real BAfoeG (Max. Rate) × Treated				.0014**	.0014**
				(.0006)	(.0006)
Real BAfoeG (Max. Rate) × First Generation × Treated				-.0005	-.0005
				(.0003)	(.0003)
Real BAfoeG (Max. Rate) × Migration Background × Treated				-.0015*	-.0015*
				(.0009)	(.0009)
Specification					
Gross Income (Main Job, T-1)	√	√	√	√	√
HH with Parents	√	√	√	√	√
Individual FE	√	√	√	√	√
Age		√	√	√	
Year					√
Simulated Treatment				√	√
N	28811	28811	28811	28811	28811
Cluster	9081	9081	9081	9081	9081
R^2	.0007	.0017	.0019	.0019	.0019
Prob > F	.0166	.0000	.0000	.0000	0

Robust Std. Errors in Parantheses

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

Note:

- Higher BAfoeg Max. Rate ⇒ higher incentive to study.
- However, negative Effect on marginalized groups (First Gen & Migration Background). Reasoning could be an increase in tightness (similar to the labor market).
- No difference between treament & non-treatment group ⇒ could indicate misspperception about BAfoeG reception or a misspecified model.
- Time-FE (Yearly) makes no sense, as treatment also varies on a yearly basis. However, regression for different time frames similar results (see Appendix - **INCLUDE TABLE**).

Using Individual (mechanical) BAfoeG as Treatment:

Table 4: Study Start: FE - Mechanical BAfoeG Variation

PR(Study Start)	(1)	(2)	(3)	(4)
Real BAfoeG (Mechanical)	-.00001	-.00002	.00000	-.00003
	(.00001)	(.00002)	(.00005)	(.00003)
Real BAfoeG (Mechanical) × First Generation		.00002	-.00001	.00003
		(.00003)	(.00005)	(.00003)
Real BAfoeG (Mechanical) × Migration Background		-.00001	.00000	-.00001
		(.00002)	(.00004)	(.00003)
Specification				
Gross Income (Main Job, T-1)	√	√	√	√
HH with Parents	√	√	√	√
Individual FE	√	√	√	√
Age	√	√	√	√
> 2010			√	
≤ 2010				√
N	28811	28811	15325	13486
Cluster	9081	9081	5842	4404
R^2	.0016	.0016	.003	.0016
Prob > F	.0000	.0000	.001	.041

Robust Std. Errors in Parantheses

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

Note:

- Interestingly, no effect by individual BAfoeG (mechanical). However, is in line with (4) of table 3. Same Reasoning: Missperception about BAfoeG (both, falsly assuming a BAfoeG reception, and underestimating the funds available).

Table 5: Non-Take-Up: Pooled Probit & IV-Probit

	(1)		(2)		(3)		(4)		(5)		(6)	
PR(Non-Take-Up)	Probit	dydx	Probit	dydx	Probit	dydx	Probit	dydx	Probit	dydx	IV-Probit	dydx
First Generation	-.1659***	-.0636***	-.2333***	-.0855***	-.2048***	-.0746***	-.2153***	-.0787***	-.2075***	-.0756***	-.2189***	-.0799***
	(.0597)	(.0228)	(.0604)	(.022)	(.0611)	(.0221)	(.0614)	(.0223)	(.0616)	(.0223)	(.0610)	(.0226)
Migration Background	.0113	.0043	-.1277**	-.0468**	-.0953	-.0347	-.112*	-.041*	-.0955	-.0348	-.1106*	-.0404*
	(.0604)	(.0232)	(.0648)	(.0237)	(.0656)	(.0238)	(.0653)	(.0238)	(.0657)	(.0239)	(.0655)	(.0240)
Simulated BAfoeG (Real)					-.0698***	-.0254***			-.0752***	-.0274***	-.0003*	-.0001*
					(.0171)	(.0062)			(.0201)	(.0072)	(.0002)	(.0001)
2. Quartile Parental Income							.1308**	.0479**	-.0118	-.0043	.091	
							(.0571)	(.0208)	(.0651)	(.0237)	(.0096)	
3. Quartile Parental Income							.1456	.0532	-.098	-.0359	.1739**	
							(.1252)	(.0451)	(.1369)	(.0504)	(.0677)	
Age (Centered at 23)			√		√		√		√		√	
Apprenticeship			√		√		√		√		√	
Sex			√		√		√		√		√	
Living in City			√		√		√		√		√	
Living with Parents			√		√		√		√		√	
East Germany			√		√		√		√		√	
Siblings			√		√		√		√		√	
Year (Dummies)	√		√		√		√		√		√	
N	4054		3930		3930		3929		3929		3930	
Pseudo-R^2	.0106		.0518		.0573		.0535		.0574		.	
Wald Chi^2	38.4782		140.7312		158.6455		150.1893		158.3297		144.6832	
Baseline predicted probability	.5940		.5971		.5974		.5971		.5973		.2473	
Wald Test											13.1327	
Prob. > Chi ^{2}											.0003	
Instrument (First Stage)											1.0407***	
											(.0120)	

Clustered Std. Errors in Parantheses (on ID)

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

Note: The simulated mechanical BAfoeG variation is used as an instrument. Regression (1) & (2) are baseline regressions with and without controls. (3), (4) & (5) indicate the issue of including both parental income and BAfoeG. In (6) SE 000065, heavily rounded to 1 with effect .00011

- Similar Non-Take UP Rates than Kalinovski Herber.
- However, different specification without Independent Funding as second instrument, personal character traits

5.2.2 Labor Supply

Intensive Margin:

Table 6: Labor Supply - Intensive Margin: Pooled OLS & IV

Labor Supply (Hrs)	(1) OLS	(2) OLS	(3) OLS	(4) IV	(5) IV
Simulated BAfoeG (Real)	-1.4224***	-1.3566***	-1.6306***	-.2084*	-.2917**
	(.0733)	(.0722)	(.0808)	(.1172)	(.1151)
First Generation			2.2152***	.7791**	.7618**
			(.3644)	(.371)	(.3677)
Migration Background			-.4899	-1.7223***	-1.8529***
			(.3644)	(.371)	(.3677)
Apprenticeship		√	√	√	√
Age			√	√	√
Sex			√	√	√
Living in City			√	√	√
Living with Parents			√	√	√
East Germany			√	√	√
Siblings			√	√	√
Year (Dummies)					√
N	12589	12589	12589	12589	12589
Cluster	3824	3824	3824	3824	3824
R^2	.0363	.0802	.1323	.1014	.1126
Wald Chi^2				602.31	719.15
RMSE	13.25	12.95	12.58	12.8	12.72
Instrument (First Stage)				.0073***	.0073***
				(.0001)	(.0001)

Cluster Robust Std. Errors in Parantheses (on ID)

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

Note:

- Higher BAfoeG ⇒ negative effect on labor supply (intensive margin). IV Approach allows for valid causal inference (taking out the simultaneity issue between BAfoeG & Hrs. worked). Hence, effect much smaller than one might assume given on (1) - (3).
- We see in Appendix, that this effect also holds for first gens, whilst not being visible for migration background.

Table 7: Labor Supply - Extensive Margin: Pooled Probit, OLS & IV

	(1)		(2)		(3)	(4)	(5)
PR(Labor Supply)	Probit	dydx	Probit	dydx	OLS	IV	IV
Simulated BAfoeG (Real)	-.0926***	-.0364***	-.106***	-.0398***	-.0401***	-.015***	-.0179***
	(.009)	(.0035)	(.0096)	(.0035)	(.0035)	(.0045)	(.0045)
First Generation			.0968***	.0363***	.0361***	.0107	.0101
			(.042)	(.0158)	(.0158)	(.0161)	(.016)
Migration Background			-.0928**	-.0348**	-.0345**	-.0562***	-.0596***
			(.042)	(.0158)	(.0158)	(.0161)	(.016)
Apprenticeship				√	√	√	√
Age				√	√	√	√
Sex				√	√	√	√
Living in City				√	√	√	√
Living with Parents				√	√	√	√
East Germany				√	√	√	√
Siblings				√	√	√	√
Year (Dummies)							√
N	12589		12589		12589	12589	12589
Cluster	3824		3824		3824	3824	3824
Pseudo-R^2	.0126		.0551				
R^2					.0739	.0669	.0742
Wald Chi^2	105.5566		492.9869			431.93	539.87
RMSE					.4800	.4800	.4800
Baseline predicted probability	.4896		.4899		.5442	.524	.5178
Instrument (First Stage)						.0073***	.0074***
						(.0001)	(.0001)

Clustered Std. Errors in Parantheses (on ID)

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

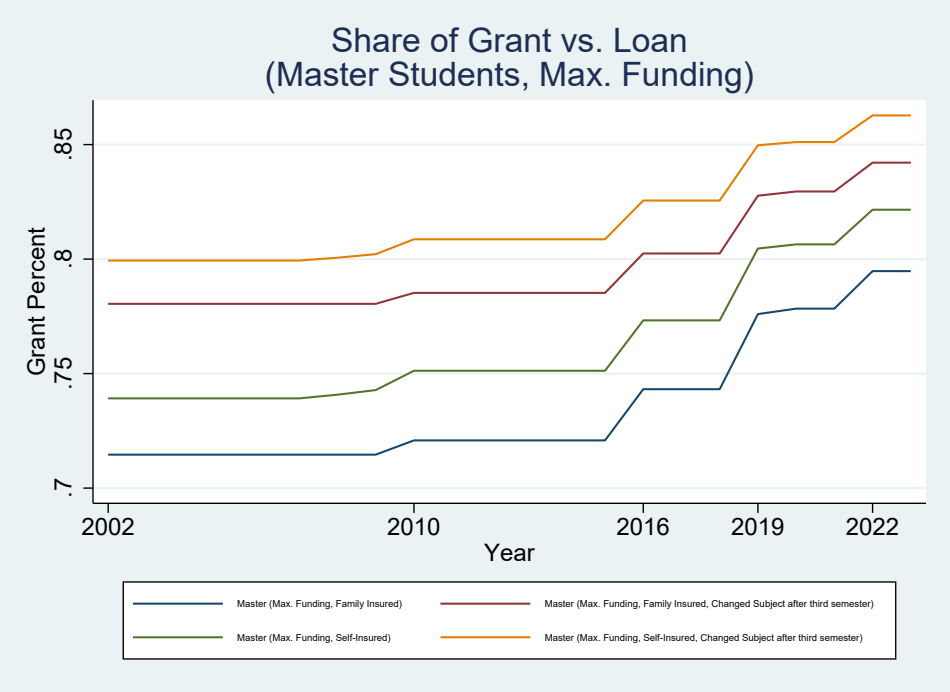
Note:

- Again argument both probit (1) & (2) and LPM yield same results as LPM (3). Hence, "normal" IV used.
- Similar change in effect sign visible

6 Discussion and Limitations

Collection of Limitations

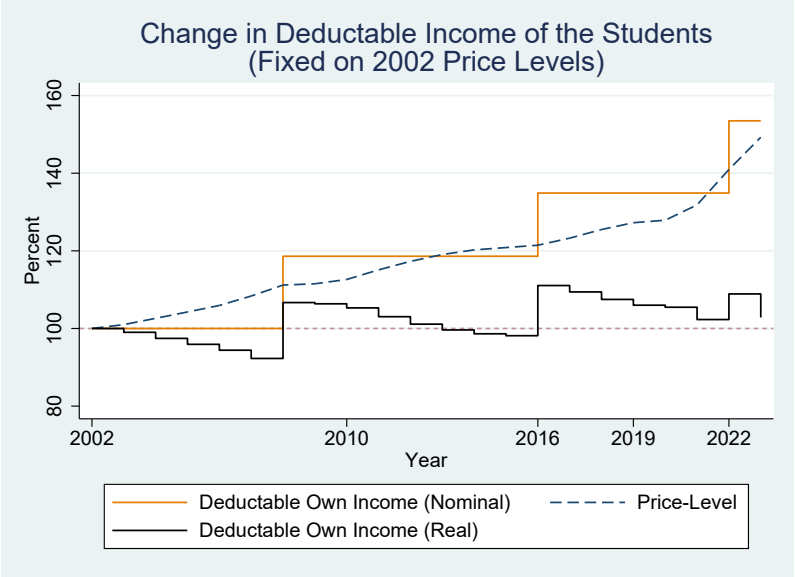
- The forgotten parameter: The "Pay-Back-Cap"

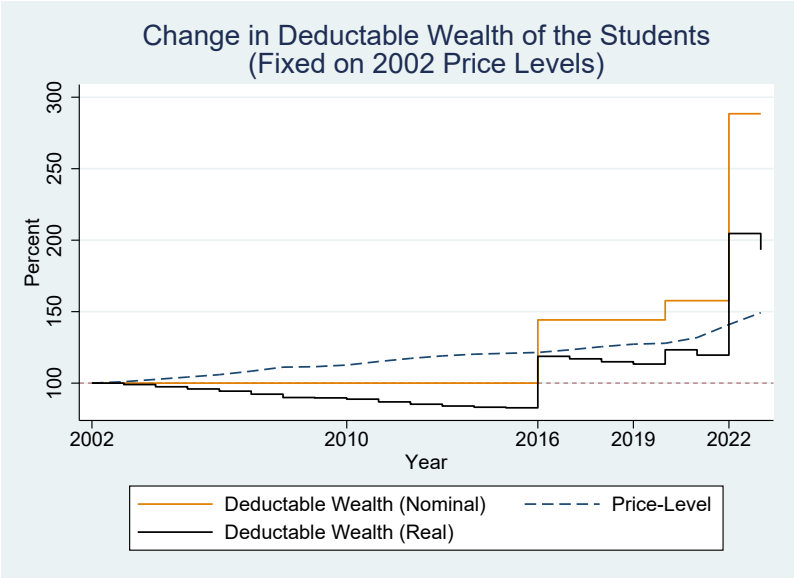


- Benefit Side cannot measure: (i) Skill (ii) Buraucrtcy costs & (iii) Effects of Uncertainty/Certainty on students
- Search & Matching in this thesis excluded.
- Causal Diagram to highlight the imposed orthogonality assumptions.

7 Summary and Concluding Remarks

A Further Figures





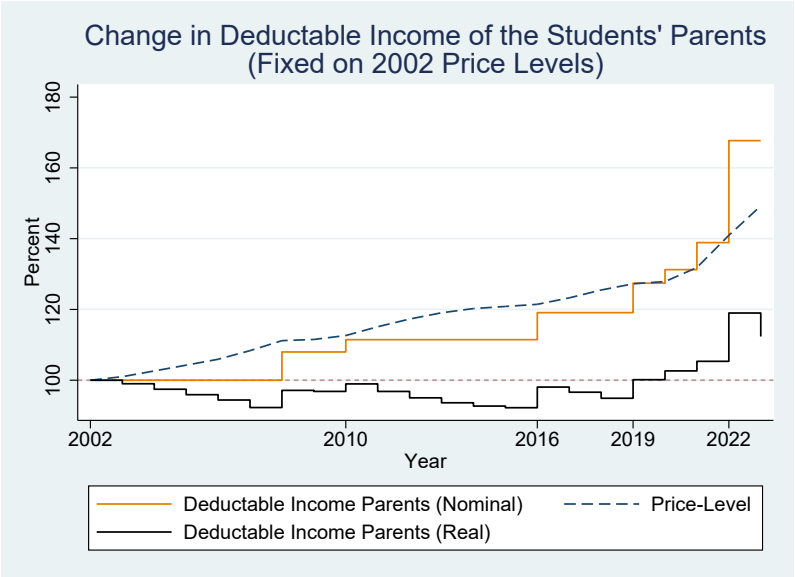

Change in Deductable Income of the Students' Parents
(Fixed on 2002 Price Levels)
Percent
100
120
140
160
180
2002
2010
2016
2019
2022
Year
Deductable Income Parents (Nominal)
Price-Level
Deductable Income Parents (Real)

Table 8: Share of BAfoeG Recipients per Year - Actual vs. Simulated

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
Received Student Grants (actual)	12589	.2361	.4247	0	1
- 2002	589	.2309	.4218	0	1
- 2003	601	.2696	.4441	0	1
- 2004	660	.2591	.4385	0	1
- 2005	633	.2243	.4175	0	1
- 2006	641	.234	.4237	0	1
- 2007	614	.2117	.4089	0	1
- 2008	607	.2273	.4195	0	1
- 2009	599	.2321	.4225	0	1
- 2010	615	.2325	.4228	0	1
- 2011	644	.264	.4411	0	1
- 2012	637	.2873	.4529	0	1
- 2013	772	.2798	.4492	0	1
- 2014	764	.2421	.4287	0	1
- 2015	812	.2389	.4267	0	1
- 2016	794	.2418	.4285	0	1
- 2017	886	.2167	.4122	0	1
- 2018	890	.191	.3933	0	1
- 2019	831	.1913	.3936	0	1
BAfoeG (simulated)	12589	.3220	.4673	0	1
- 2002	589	.3379	.4734	0	1
- 2003	601	.3411	.4745	0	1
- 2004	660	.2894	.4538	0	1
- 2005	633	.2717	.4452	0	1
- 2006	641	.259	.4384	0	1
- 2007	614	.2492	.4329	0	1
- 2008	607	.2685	.4436	0	1
- 2009	599	.2805	.4496	0	1
- 2010	615	.3122	.4638	0	1
- 2011	644	.3323	.4714	0	1
- 2012	637	.3312	.471	0	1
- 2013	772	.3795	.4856	0	1
- 2014	764	.3442	.4754	0	1
- 2015	812	.3387	.4735	0	1
- 2016	794	.3766	.4848	0	1
- 2017	886	.3533	.4783	0	1
- 2018	890	.3371	.473	0	1
- 2019	831	.3333	.4717	0	1

Note: Student Grants include state funding (BAfoeG) as well as other forms of stipends. BAfoeG amounts are calculated under the assumption of optimal behavior and always assume an application is made if the amount is greater than zero. Therefore, these figures may be higher than the actual amounts received.

Table 9: Summary Statistics Non-Students (2002-2019)

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
Individual Characteristics:					
Age	25458	25.7247	5.0839	17	35
Male	25458	.5171	.4997	0	1
Migration Background	25458	.2708	.4444	0	1
First Gen	25458	.6952	.4603	0	1
Income:					
Inc. Student (€, Gross, Mth.)	25458	1315.5583	1301.5073	0	49000
Labor Supply	25458	.7996	.4003	0	1
Labor Supply (Weekly Hours)	25458	27.4549	17.4159	0	80
Inc. Father (€, Gross, Mth.)	25458	2144.1482	3181.3766	0	104000
Inc. Mother (€, Gross, Mth.)	25458	1050.8017	1345.8818	0	25000

Note: A person is considered a non-student if they are under 35 years old, have earned the right to study, but are not studying in the respective year and have not finished any post-secondary degree.