
The FIT Labour Supply Model for Germany

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Michael Kalinowski and Carsten Hänisch

Introduction - About Fraunhofer FIT

- Established research group in development of microsimulation models
- Major clients: German federal ministries
- Among these projects:
 - Long-term (~20 years) labour supply projections for the German Federal Ministry of Education and Research (2007) and the former Bund-Länder Commission for Educational Planning and Research (2001)
 - Since 2008 in cooperation with:
 - Federal Institute for Vocational Education and Training (BIBB)
 - Institute for Employment Research (IAB)
 - Institute of Economic Structures Research (GWS)

Main data sources (Labour Supply)

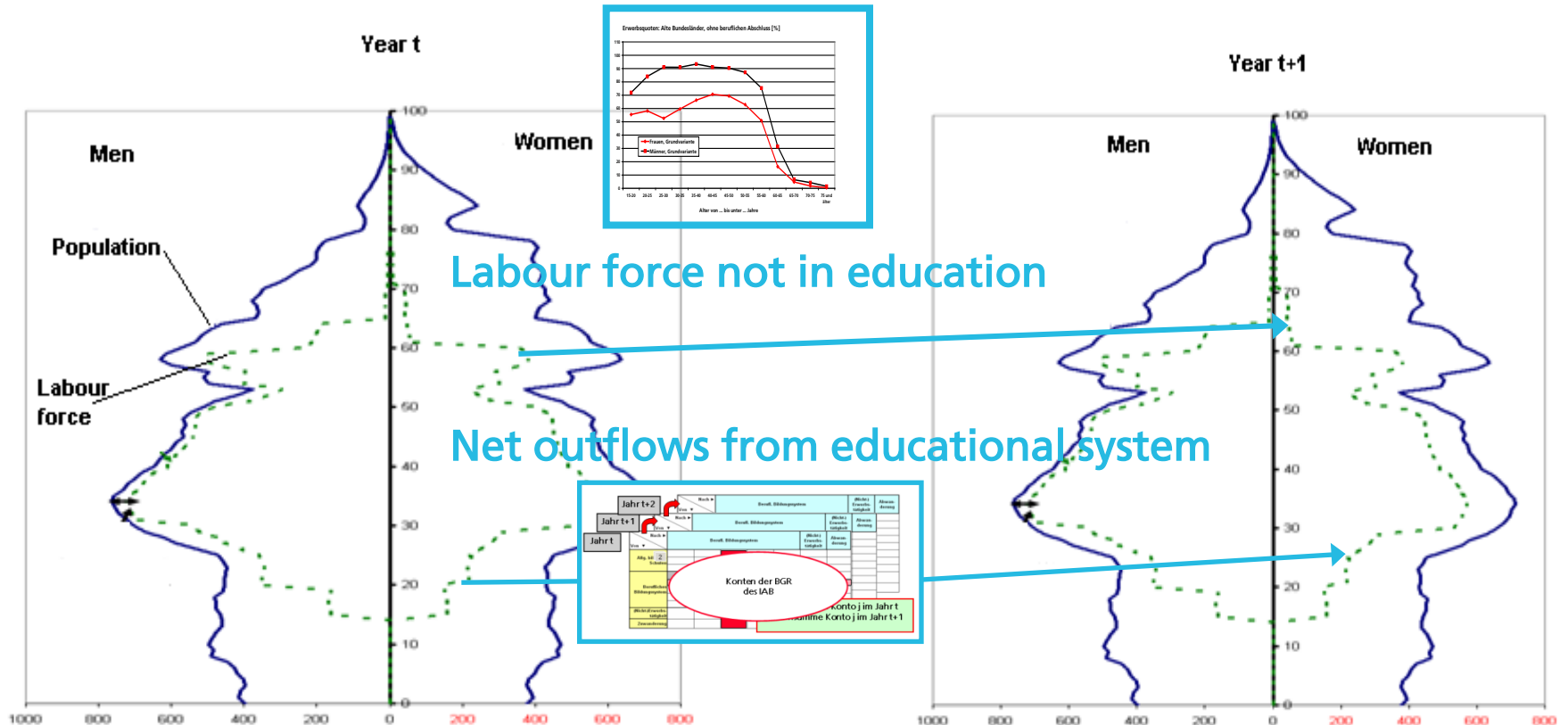
- Education statistics (FSO - Federal Statistical Office), yearly
- Projections of future stocks in the educational system (KMK - Standing Conference of the Ministers of Education and Cultural Affairs of the Länder in the Federal Republic), every 3-5 years
- Population projections (FSO), every 3-5 years
 - Population, births, deaths and net migration
- German Microcensus (MC), yearly, 1% subsample
 - Labour force participation rates
 - Qualification and occupational structure
 - Adjusted to national accounts (NA) and education statistics

Levels of aggregation

- Age, Gender
- 4 skill levels (ISCED)
- Initial vocational qualification by specialisation recoded from MC 05-08

- Results:
 - Remaining labour force not in education
 - New labour force supply from educational system
 - New labour force supply from migration

Fraunhofer FIT Model



Labour Supply: Forecasting method

- Starting point: Basic balancing equation where t is the end of the year

$$(1) p_t = p_{t-1} + b_{t-1} - d_{t-1} + i_t - e_t$$

with $b_{t-1} - d_{t-1} = ni_{t-1}$ (natural increase) and $i_t - e_t = nmig_t$ (net migration)

- Forecasting population by age, sex, qualification: *not* in education (pne):

$$(2) pne_{t,a,s,q} = pne_{t-1,a-1,s,q} + ni_{t-1,a-1,s,q} + nmig_{t,a,s,q} + nedu_{t,a,s,q}$$

- Total population in t:

$$(3) p_{t,a,s,q} = pne_{t-1,a-1,s,q} + pie_{t-1,a-1,s,q}$$

- Labour force supply:

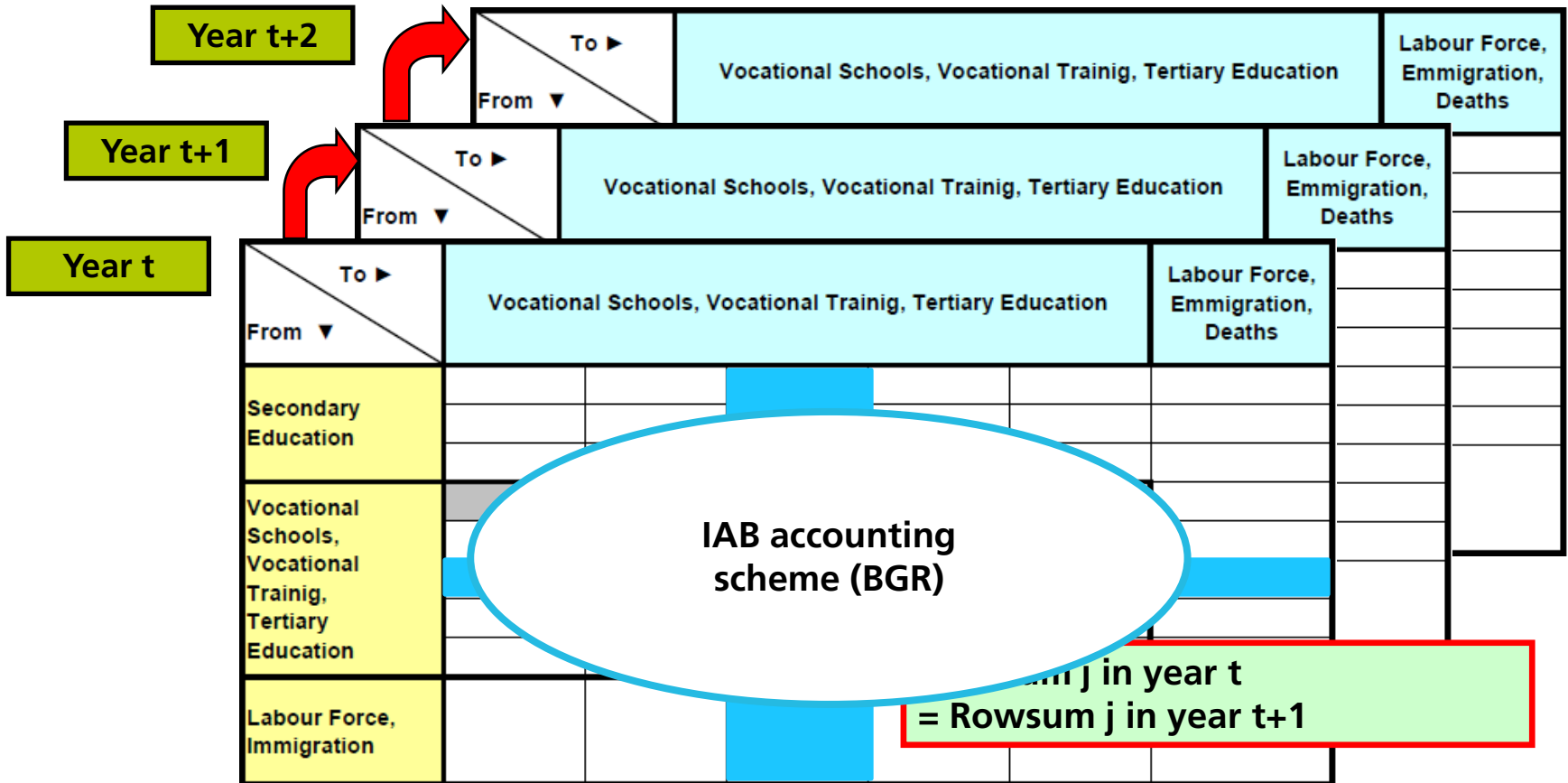
$$(4) ifs_{t,a,s,q} = pne_{t,a,s,q} * lfrne_{t,a,s,q} + pie_{t,a,s,q} * lfrie_{t,a,s,q}$$

→ But: How are $nmig_{t,a,s,q}$ and $nedu_{t,a,s,q}$ determined?

German Educational System - Transition model to describe stocks and flows

- *Starting point:* Stocks in educational institutions
- Main Problems:
 - Availability and consistency of data (MC vs. FSO and NA)
 - Use of adjustment algorithms
- Basic method:
 - $stock_t = stock_{t-1} + entrants_t - graduates_t$
 - *Stocks at the end of one year are equal to Stocks at the beginning of the following year*
- Available information on transitions from GSOEP, FSO-Data on education, ...
- ... are not consistent: Again use of adjustment algorithms to determine most likely transition structure
- *Result: Transition matrix of the educational system*

German Educational System - Accounts



German Educational System – Accounts

		Germany									Year 2000						
		Education									Labour Market						
to from	BVJ/ BGJ	BVM	BFS	BL	SdG	FS	FOS/ FGY	FHS	UNI	ALO	WPFL/ ZIVI	EWT	NEP	AWT	Ab- gänge	JA	
HSA	38,5	25,2	60,1	123,6	0,8	0,5	0,0	0,0	0,0	38,9	0,2	8,0	11,9	7,3	315,0	315,0	
MBA	13,8	5,6	81,0	157,7	4,1	1,6	60,0	0,0	0,0	15,4	0,4	12,3	4,2	13,0	369,0	369,0	
HSR	1,0	0,0	4,4	37,7	1,2	1,9	0,0	12,2	60,5	3,8	77,1	15,3	11,4	6,9	233,4	233,4	
BVJ/BGJ	0,0	6,5	15,7	56,3	0,4	0,0	1,3	0,0	0,0	0,6	0,1	3,7	3,0	5,1	92,6	92,6	
BVM	11,7	14,8	2,2	27,4	1,0	0,0	2,9	0,0	0,0	13,3	0,8	8,8	7,5	4,8	80,1	94,9	
BFS	3,8	0,5	206,8	91,0	13,4	8,4	3,1	3,7	10,0	2,7	21,2	102,8	1,2	1,7	263,2	469,8	
BL	0,0	0,0	2,5	1079,0	1,9	9,2	12,2	2,4	11,4	77,5	28,9	435,5	29,5	8,2	619,3	1698,3	
SDG	0,0	0,0	0,3	0,6	76,9	0,3	2,5	1,2	1,1	1,1	0,5	29,8	0,8	0,8	38,9	115,8	
FS	0,0	0,0	0,1	0,2	0,1	50,5	0,2	1,8	4,8	0,4	0,8	40,4	0,2	0,3	48,7	99,2	
FOS/FGY	0,0	0,0	4,2	4,4	0,7	3,3	120,8	18,7	7,7	3,4	17,5	19,5	2,6	4,6	86,5	207,3	
FHS	0,0	0,0	0,8	1,0	0,2	0,8	0,0	357,5	5,8	1,8	3,1	65,9	2,4	2,4	83,7	441,2	
UNI	0,0	0,0	1,1	2,9	0,7	1,2	0,0	12,7	1105,4	5,2	2,3	161,3	10,4	8,3	206,2	1311,5	
ALO	2,1	7,8	4,4	18,1	1,5	2,4	2,4	9,4	17,1	1408,5	4,0	1237,1	1130,4	202,0	2638,7	4047,2	
WPFL/ZIVI	0,0	0,0	2,1	53,0	0,3	1,5	1,8	21,8	52,3	0,8	0,0	128,3	1,1	4,0	266,8	266,8	
EWT	13,7	7,5	3,3	18,1	1,4	8,8	4,2	7,1	16,3	1150,2	88,3	33484,3	1114,4	383,7	2817,1	36301,4	
NEP	8,7	13,5	2,9	4,3	1,9	2,0	2,8	4,1	4,2	983,4	0,8	613,3	19379,9	880,8	2502,4	21882,3	
ZUW	3,8	17,2	10,1	26,7	6,6	6,0	4,9	4,1	25,2	121,8	0,2	288,7	303,8			819,1	

Zugänge	97,2	83,8	194,9	622,9	36,1	47,7	98,0	98,9	216,1	2400,4	245,8	3170,3	2634,7		Σ JA =	67945,7
JE	97,2	98,6	401,5	1702,0	113,0	98,2	218,8	456,4	1321,4	3808,9	245,8	36654,6	22014,6	1533,8	Σ JE =	67231,0

Source: IAB/Bildungsgesamtrechnung

- Focus on transition into/out of labour market
- On main diagonal: „Stayer“
- Off the main diagonal: Transitions
- First three rows: Secondary education

Example: Stocks and Transitions (BVM= vocational preparation scheme)

```

-*****
-
-          BVM
-*****
-
zugbvm := uhsabvm + umbabvm + uhsrbvm
         + ubgjbvm           + ubfsbvm + ublbvm + usdgbvm
         + ufsbvm + ufosbvm + ufgybvm + ufhsbvm + uwhsbvm
         + uwpfbvm + uambvm + uzuwbvm;

bvm1 := zugbvm;
bvm2 := uqgbvm2 * bvm1(t-1)/100;
bvm  := bvm1 + bvm2;

- Abgänger insgesamt
abgbvm := (1-uqgbvm2/100)*bvm1(t-1) + bvm2(t-1);

ubvmbgj := uqgbvmbgj*abgbvm/100;

ubvmbfs := uqgbvmbfs*abgbvm/100;
ubvmb1  := uqgbvmb1 *abgbvm/100;
ubvmsdg := uqgbvmsdg*abgbvm/100;
ubvmfs  := uqgbvmfs *abgbvm/100;
ubvmfos := uqgbvmfos*abgbvm/100;
ubvmfgy := uqgbvmfgy*abgbvm/100;
ubvmfhs := uqgbvmfhs*abgbvm/100;
ubvmwhs := uqgbvmwhs*abgbvm/100;
ubvmwfp := uqgbvmwfp*abgbvm/100;
ubvmam  := uqgbvmam *abgbvm/100;
ubvmawt := uqgbvmawt*abgbvm/100;

```

← Entrants in BVM

← Forecast BVM

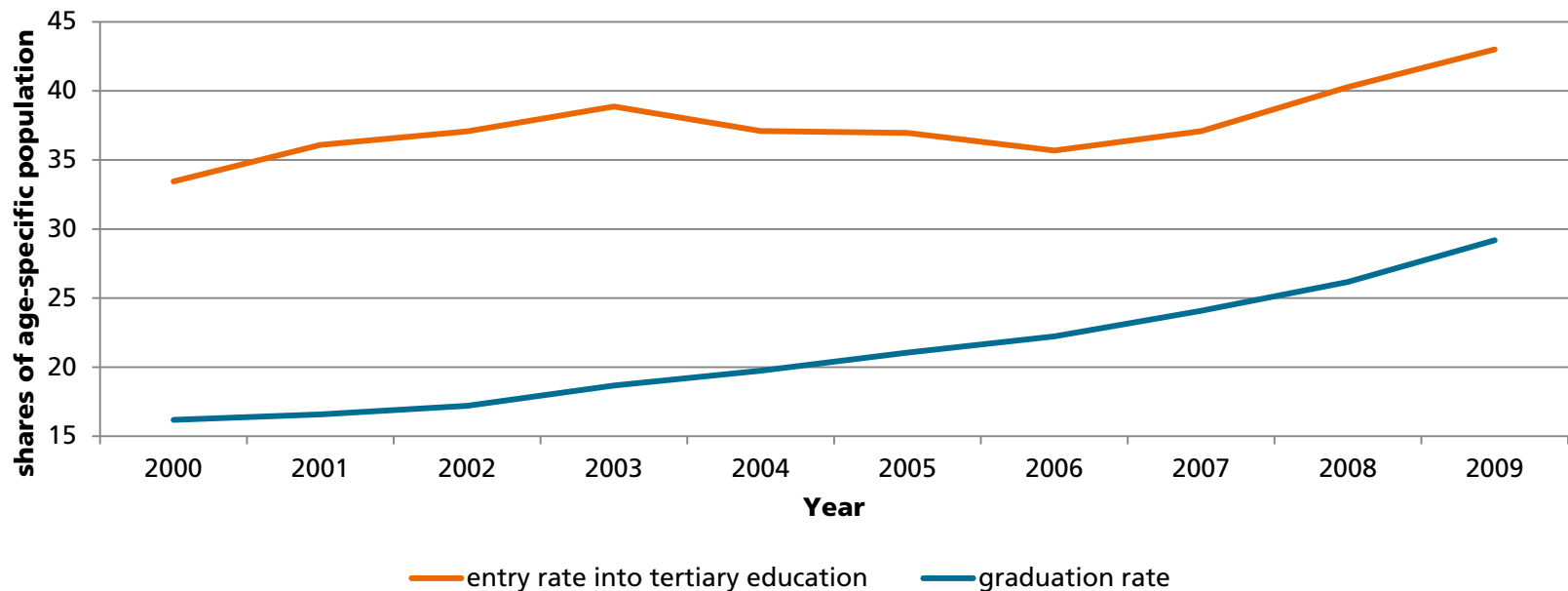
← Exits in other accounts including labour market with transition rates „uqxxxyyy“

xxx = source

yyy = target

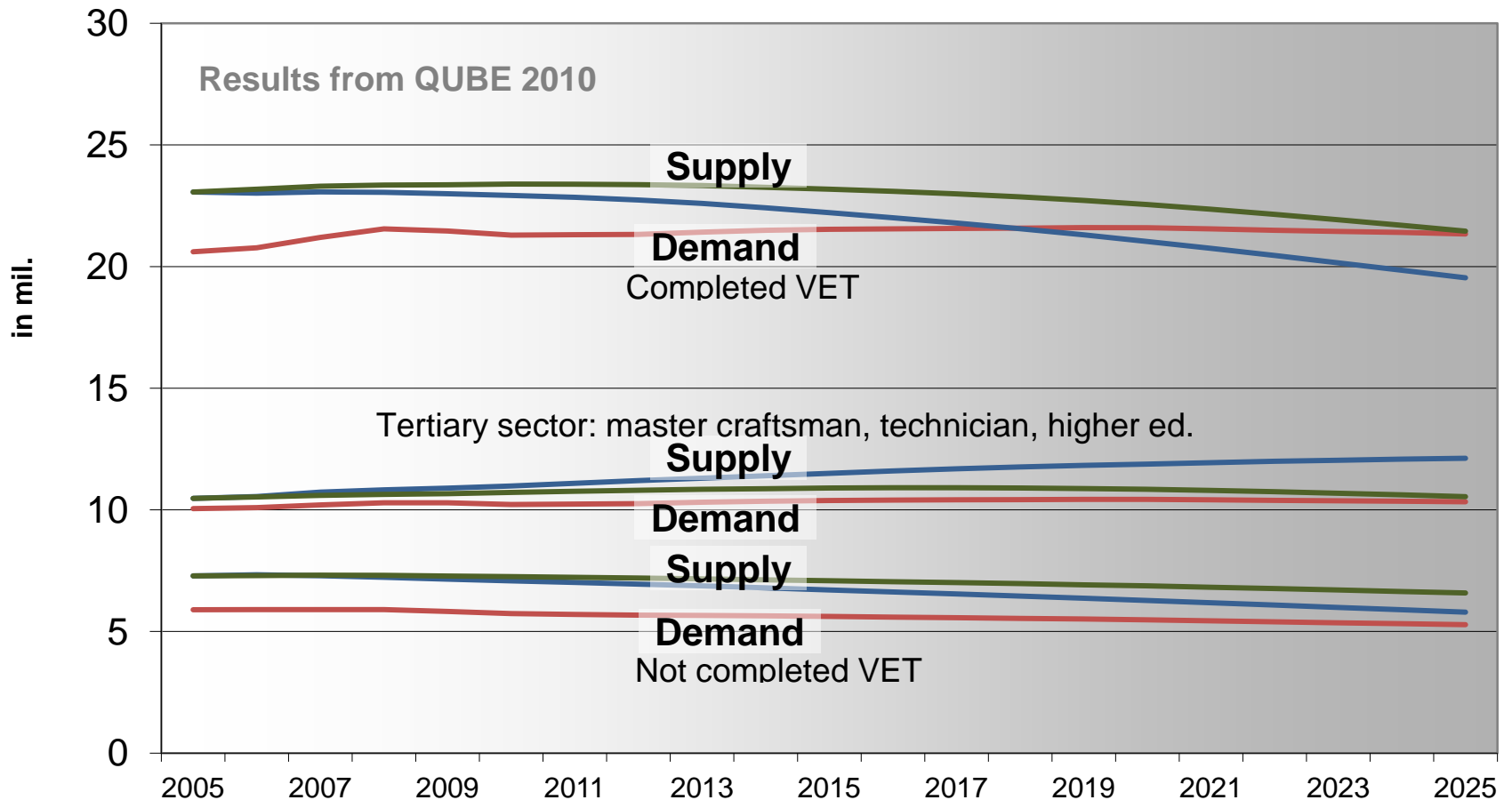
Pitfalls

- Curtailment of schooling at the *Gymnasium* from nine to eight years
- Suspension of compulsory military service
- *Additional school leavers and inflows in tertiary education*



Source: FSO

Selected Results for Germany



Thank you

www.qube-projekt.de/

http://www.fit.fraunhofer.de/fb/risk/mikmod_en.html