The FIT Labour Supply Model for Germany

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Fraunhofer FIT

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

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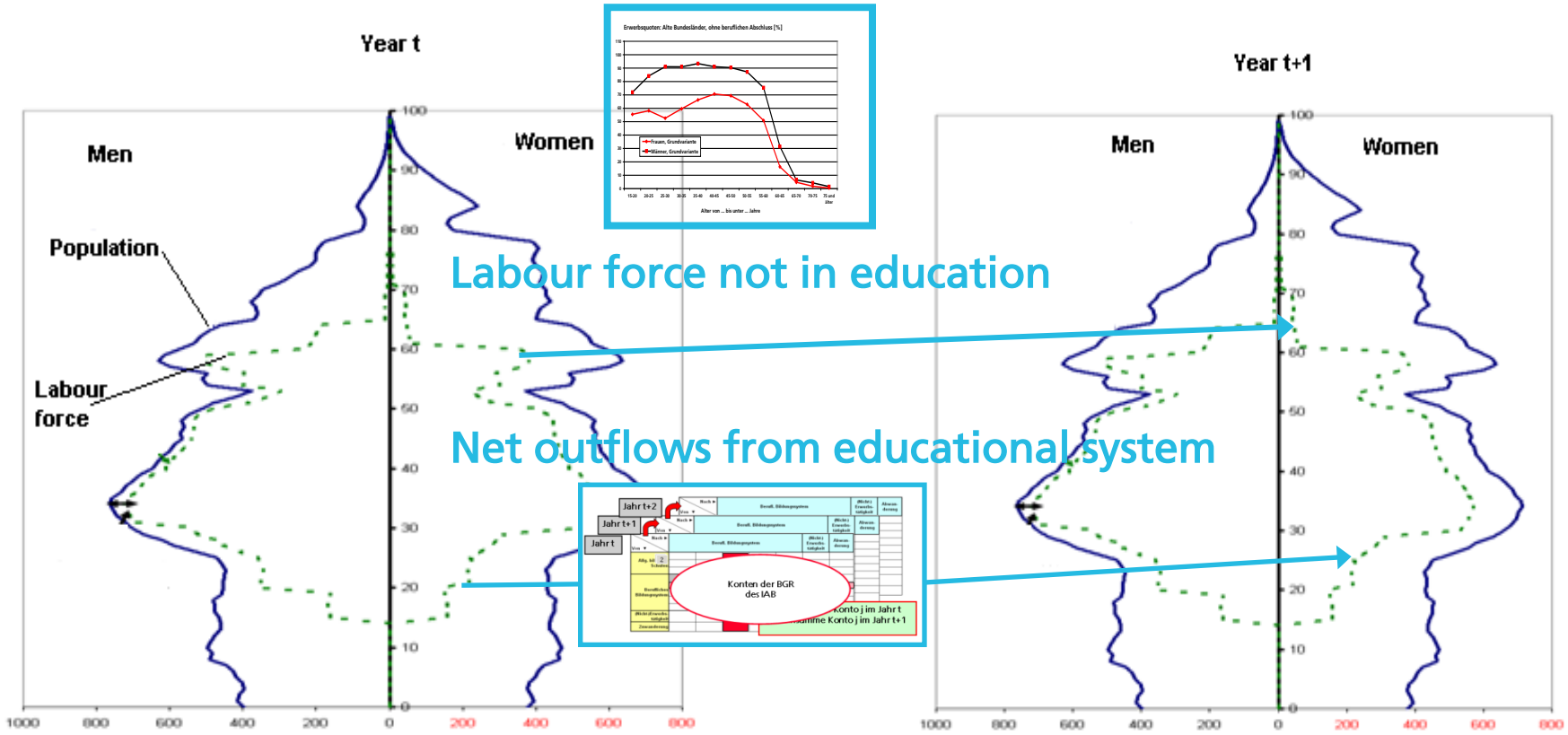


Labour Supply: Forecasting method

- 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:

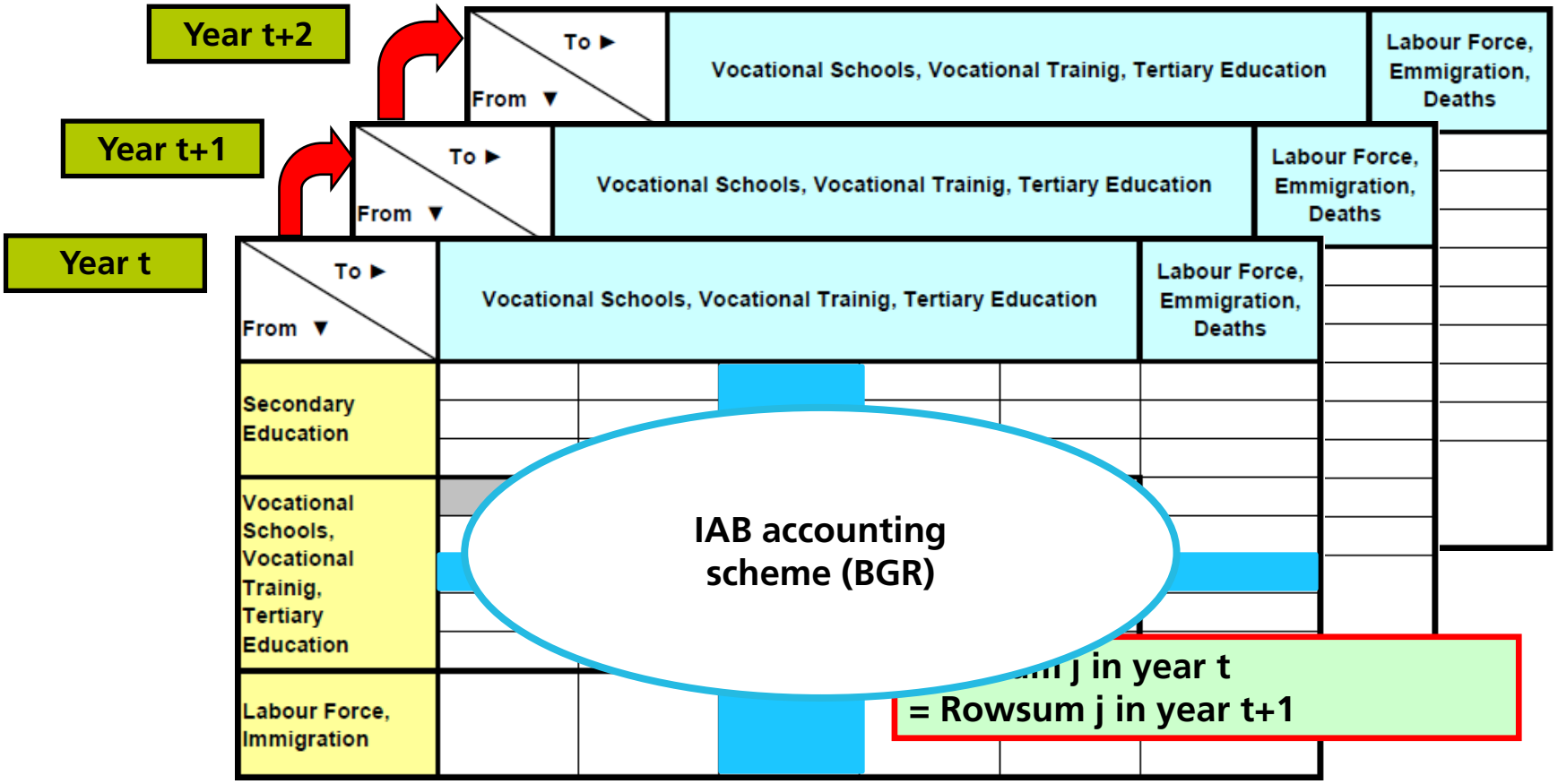
  (4) $lfs_{t,a,s,q} = pne_{t,a,s,q} * lfrne_{t,a,s,q} + pie_{t,a,s,q} * lfrie_{t,a,s,q}$

→ 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 eductational 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

in 1000 Germany Year 2000

to / from	Education									Labour Market						
	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	8,6	7,5	*4,8*	80,1	94,9
BFS	3,8	0,5	206,6	91,0	13,4	8,4	3,1	3,7	10,0	2,7	21,2	102,6	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	1,6	4,6	0,4	0,6	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	0,6	1,0	0,2	0,6	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	1,6	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	0,6	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

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

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


bvm1 := zugbvm;
bvm2 := uqbvm2 * bvm1(t-1)/100;
bvm  := bvm1 + bvm2;

- Abgänger insgesamt
abgbvm := (1-uqbvm2/100)*bvm1(t-1)  + bvm2(t-1);

ubvmbgj := uqbvmbgj*abgbvm/100;

ubvmbfs := uqbvmbfs*abgbvm/100;
ubvmbl  := uqbvmbl *abgbvm/100;
ubvmsdg := uqbvmsdg*abgbvm/100;
ubvmfs  := uqbvmfs *abgbvm/100;
ubvmfos := uqbvmfos*abgbvm/100;
ubvmfgy := uqbvmfgy*abgbvm/100;
ubvmfhs := uqbvmfhs*abgbvm/100;
ubvmwhs := uqbvmwhs*abgbvm/100;
ubvmwpf := uqbvmwpf*abgbvm/100;
ubvmam  := uqbvmam *abgbvm/100;
ubvmawt := uqbvmawt*abgbvm/100;
```

← Entrants in BVM

← Forecast BVM

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

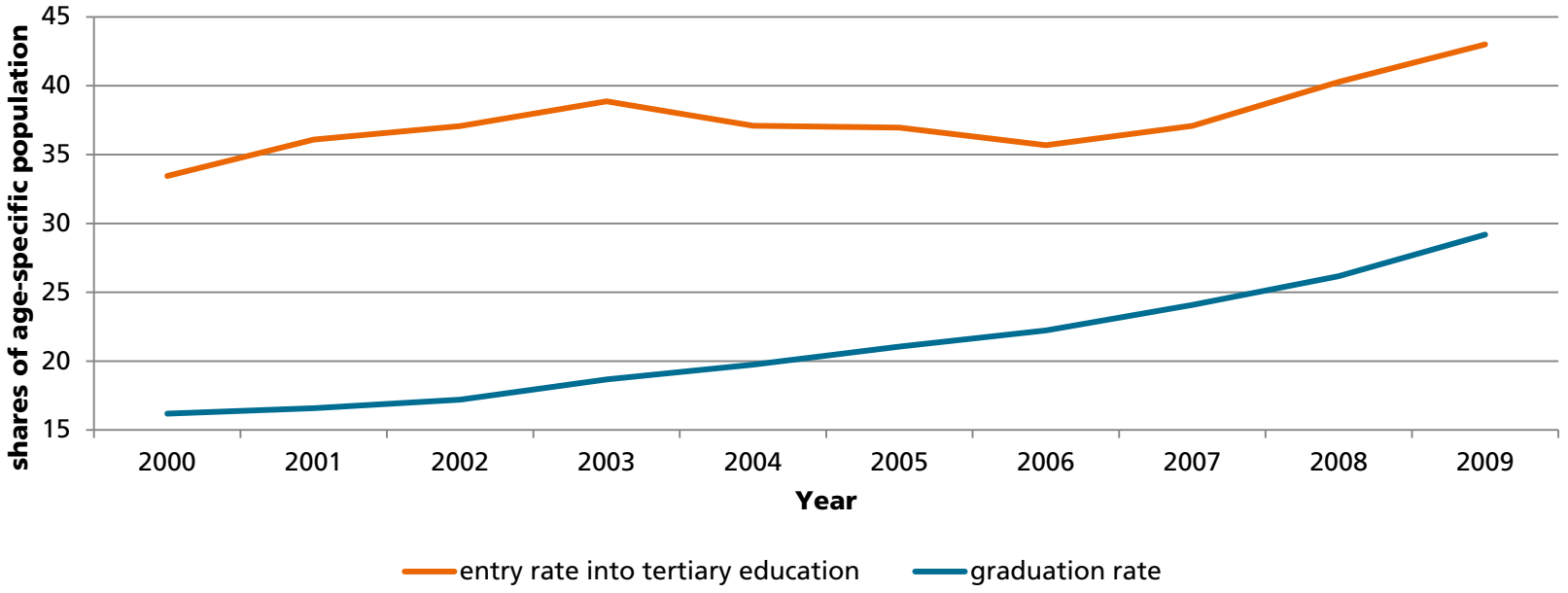
xxx = source

yyy = target

Pitfalls

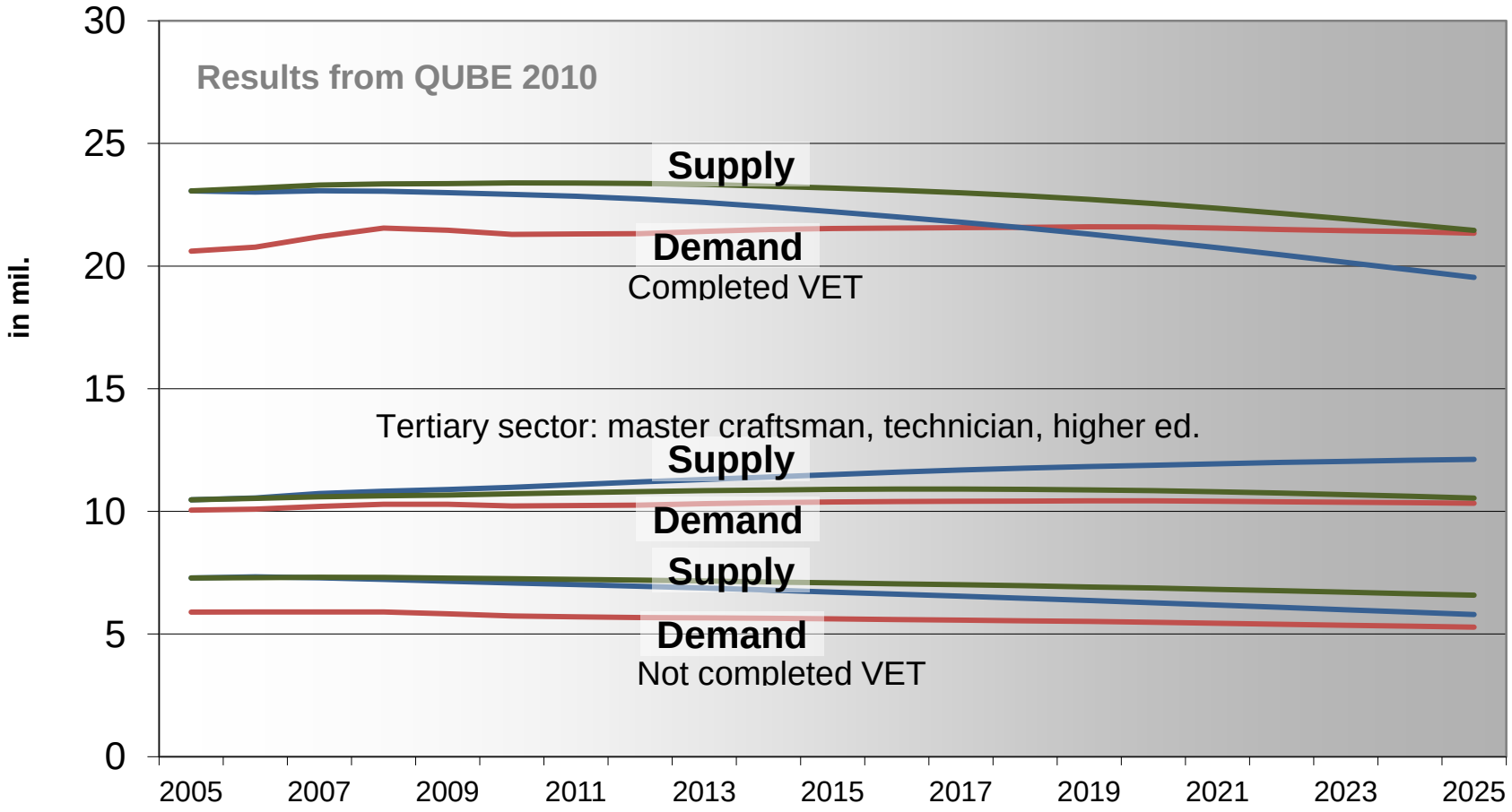
- Curtailment of schooling at the *Gymnasium from nine to eight years*
- Suspension of compulsory military service

→ *Additional school leavers and inflows in tertiary education*



Source: FSO

Selected Results for Germany



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Thank you

*www.**qube**-projekt.de/*

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