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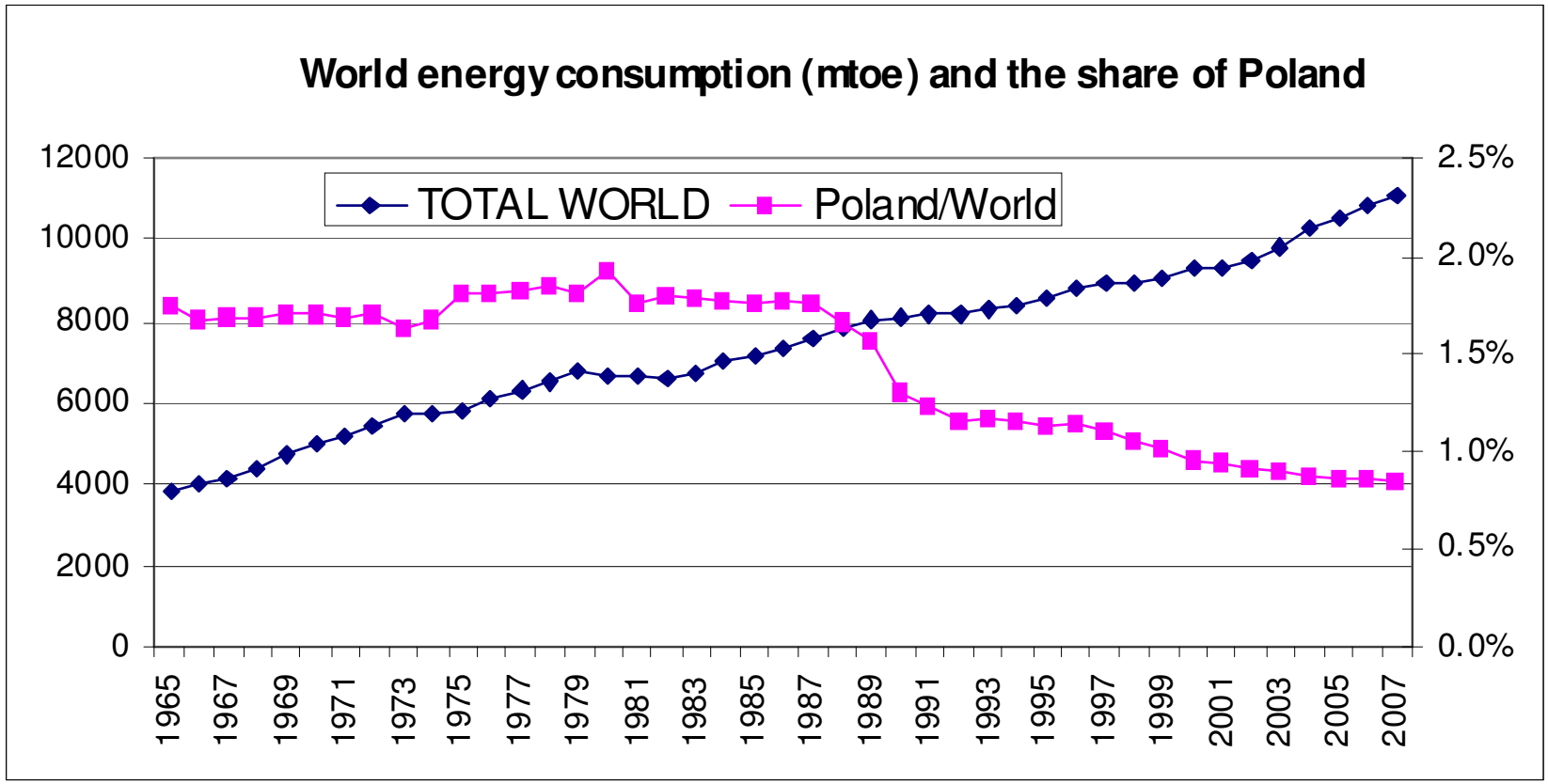
Prices of Energy and the Polish Economy

INSTITUTE OF ECONOMETRICS

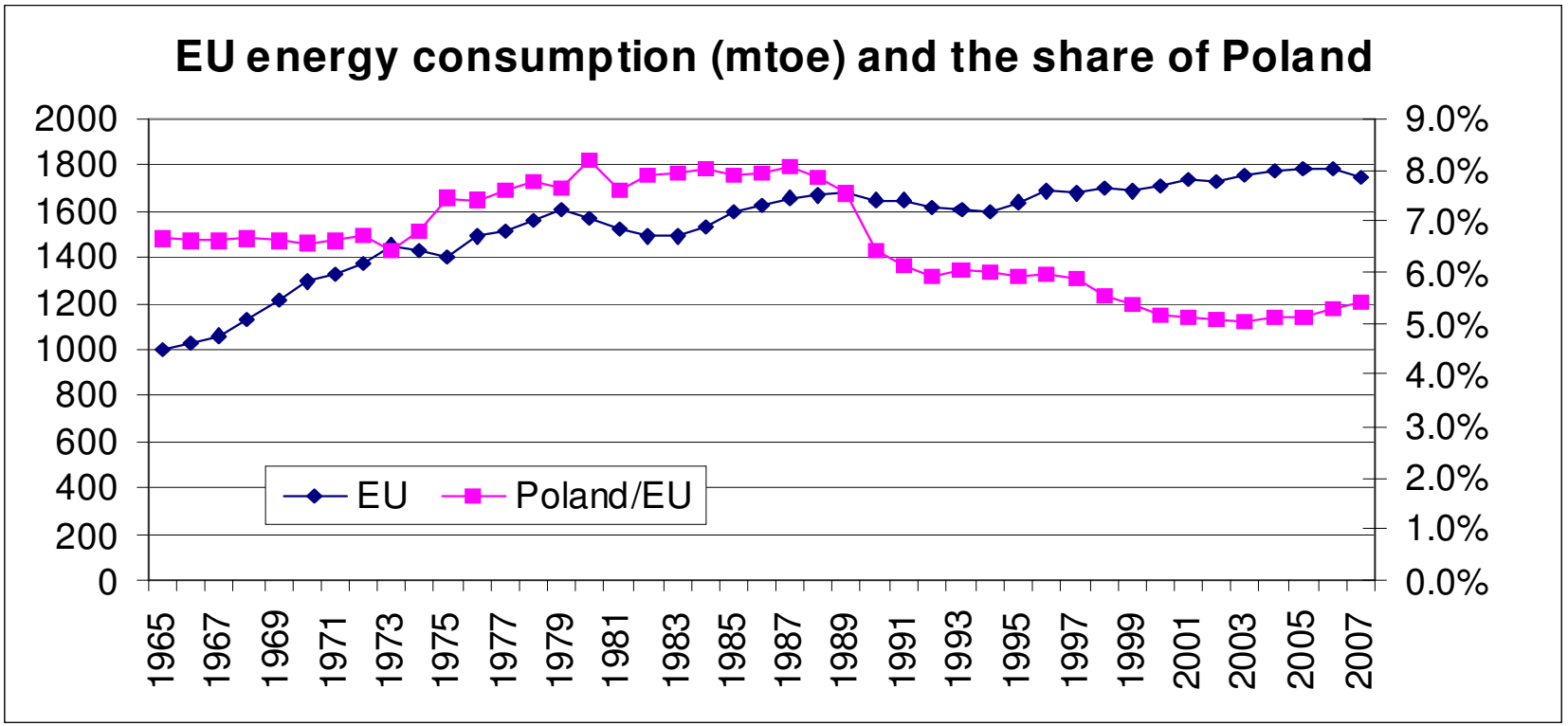
Plan of the presentation

- Energy in the Polish economy
- Model
- Assumptions for simulations
- Results of simulations
- Conclusions

Energy in the Polish economy

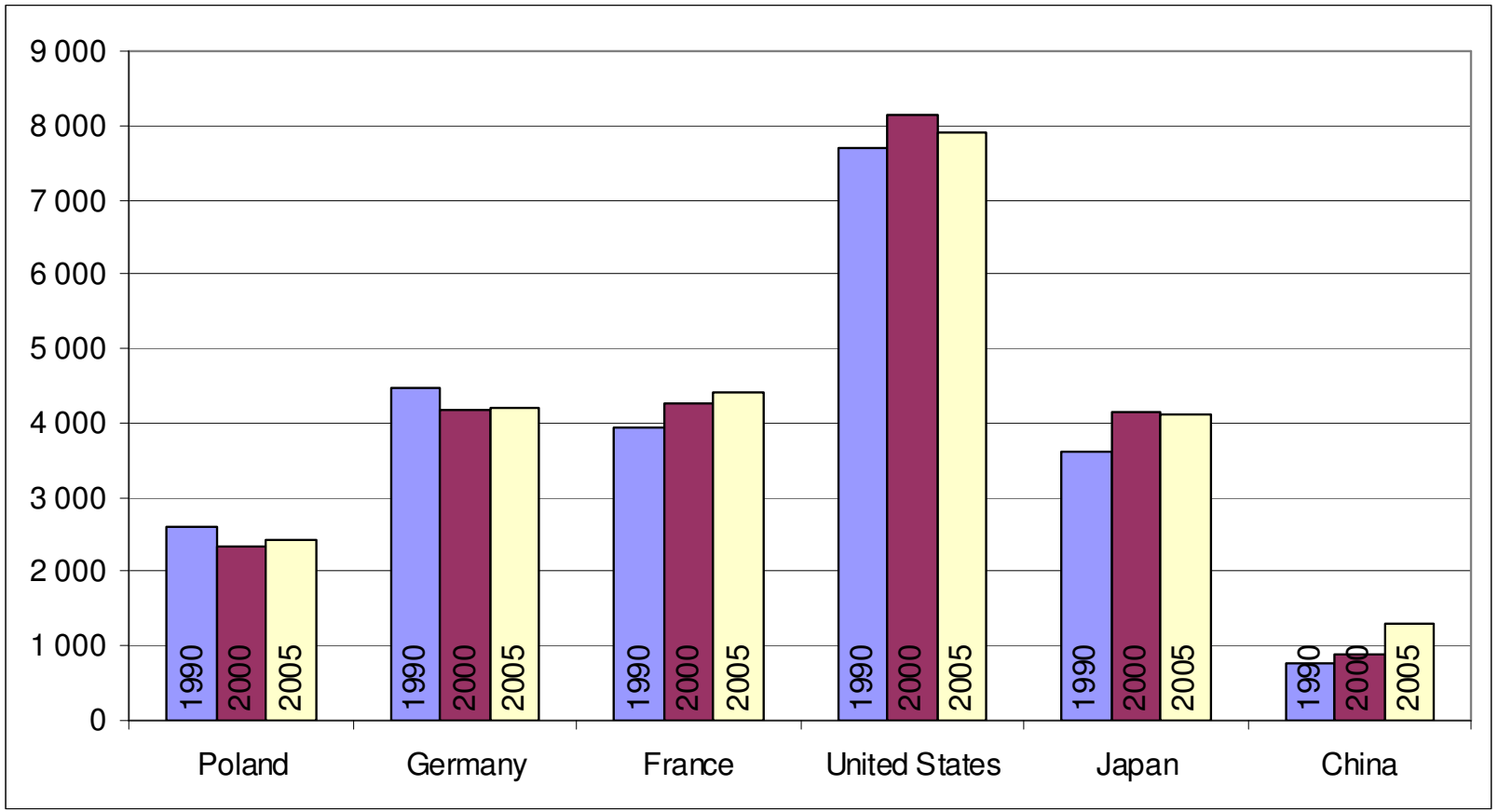


Energy in the Polish economy



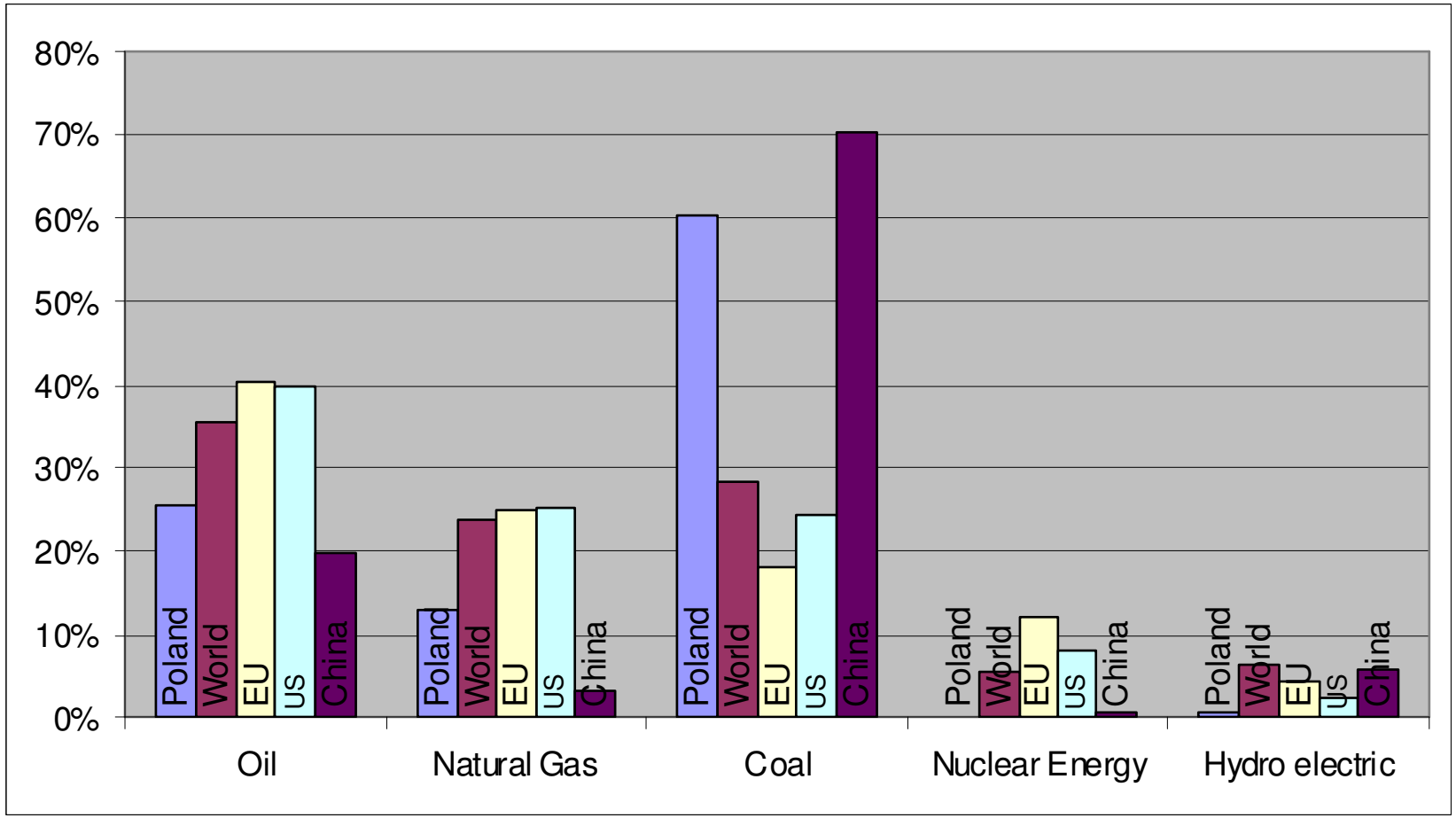
Energy in the Polish economy

Energy use per capita (kgoe) in Poland and other countries



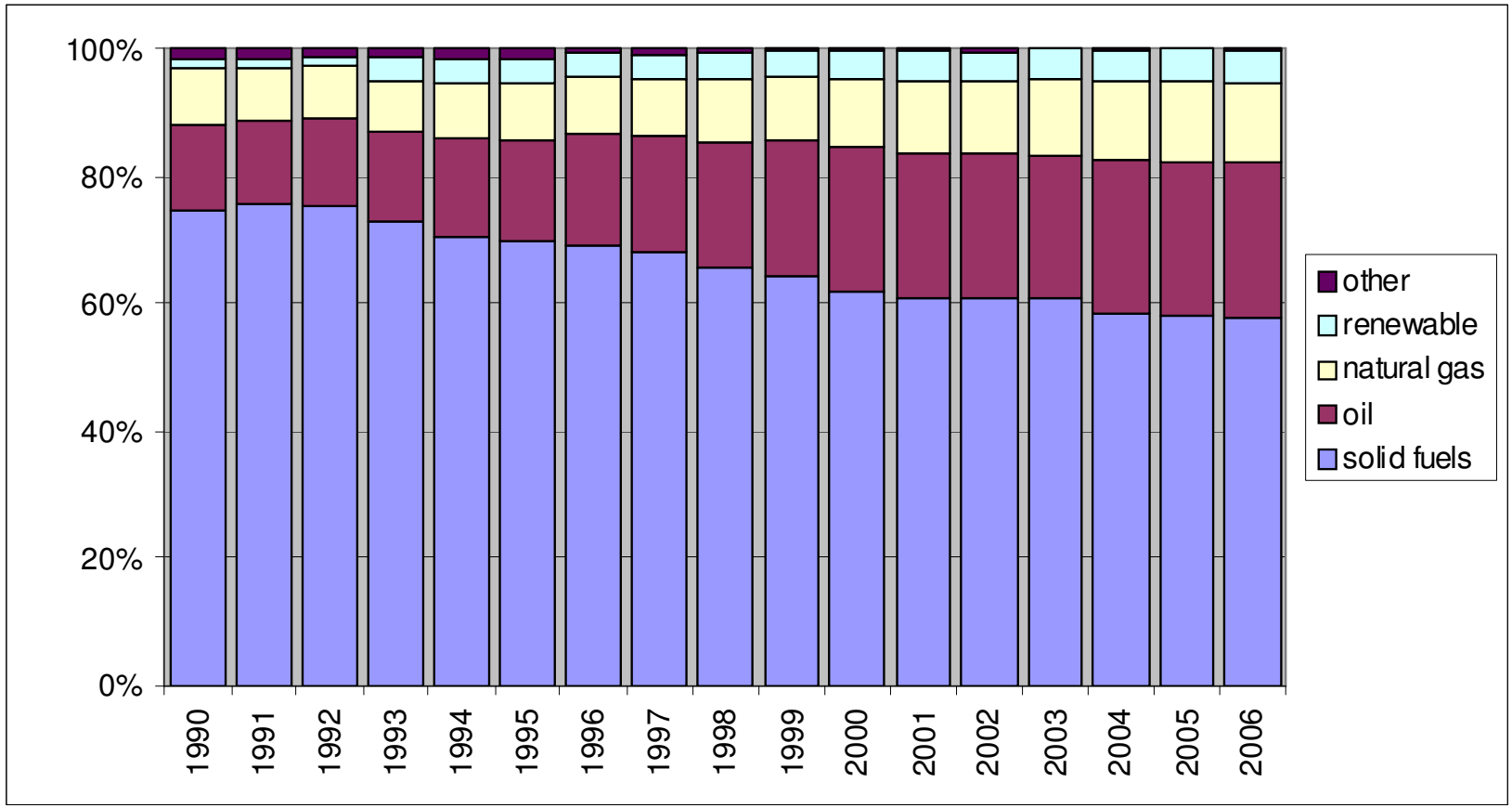
Energy in the Polish economy

Structure of primary energy consumption in Poland & other countries



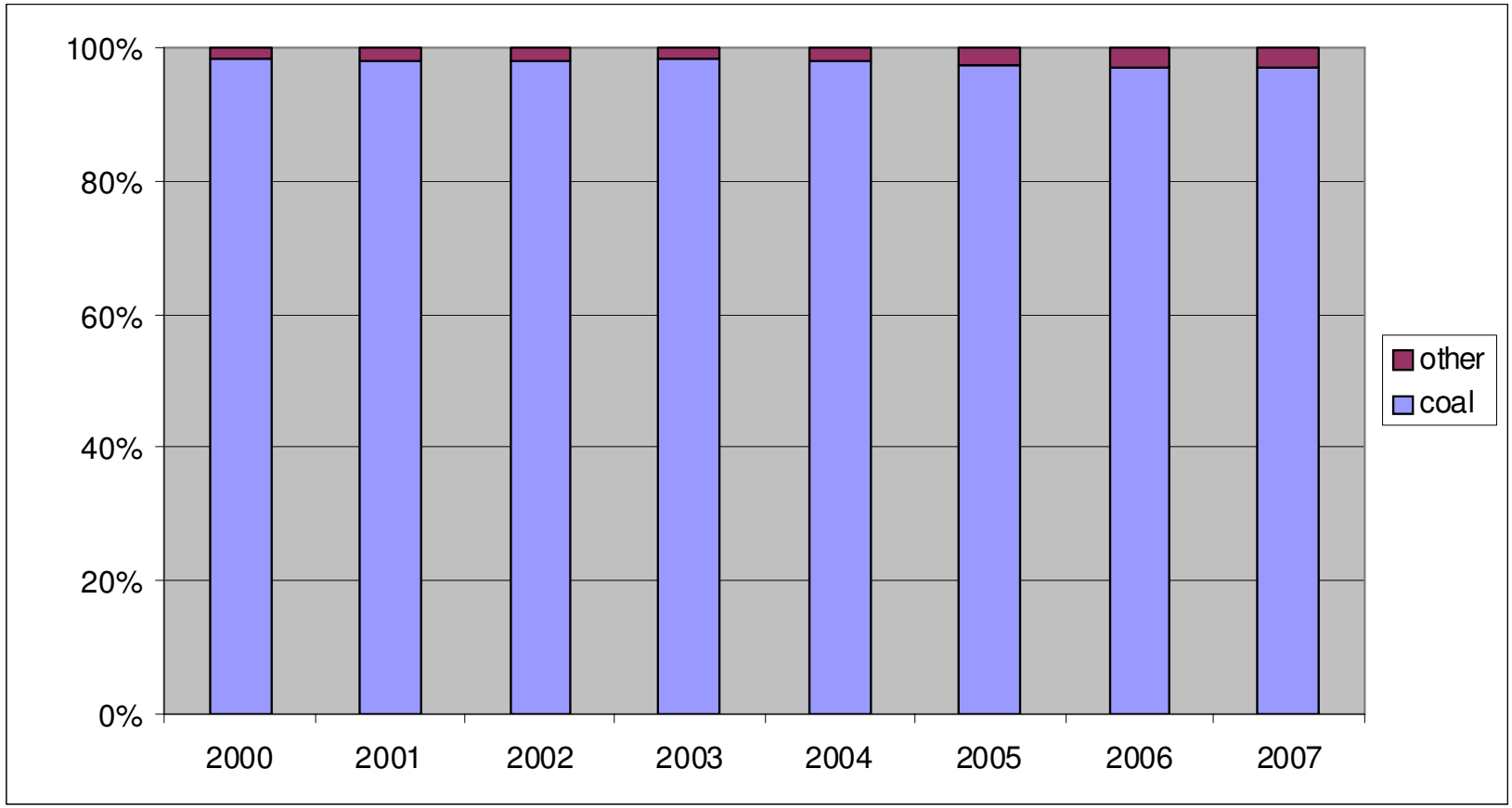
Energy in the Polish economy

Changes i structure of primary energy consumption in Poland



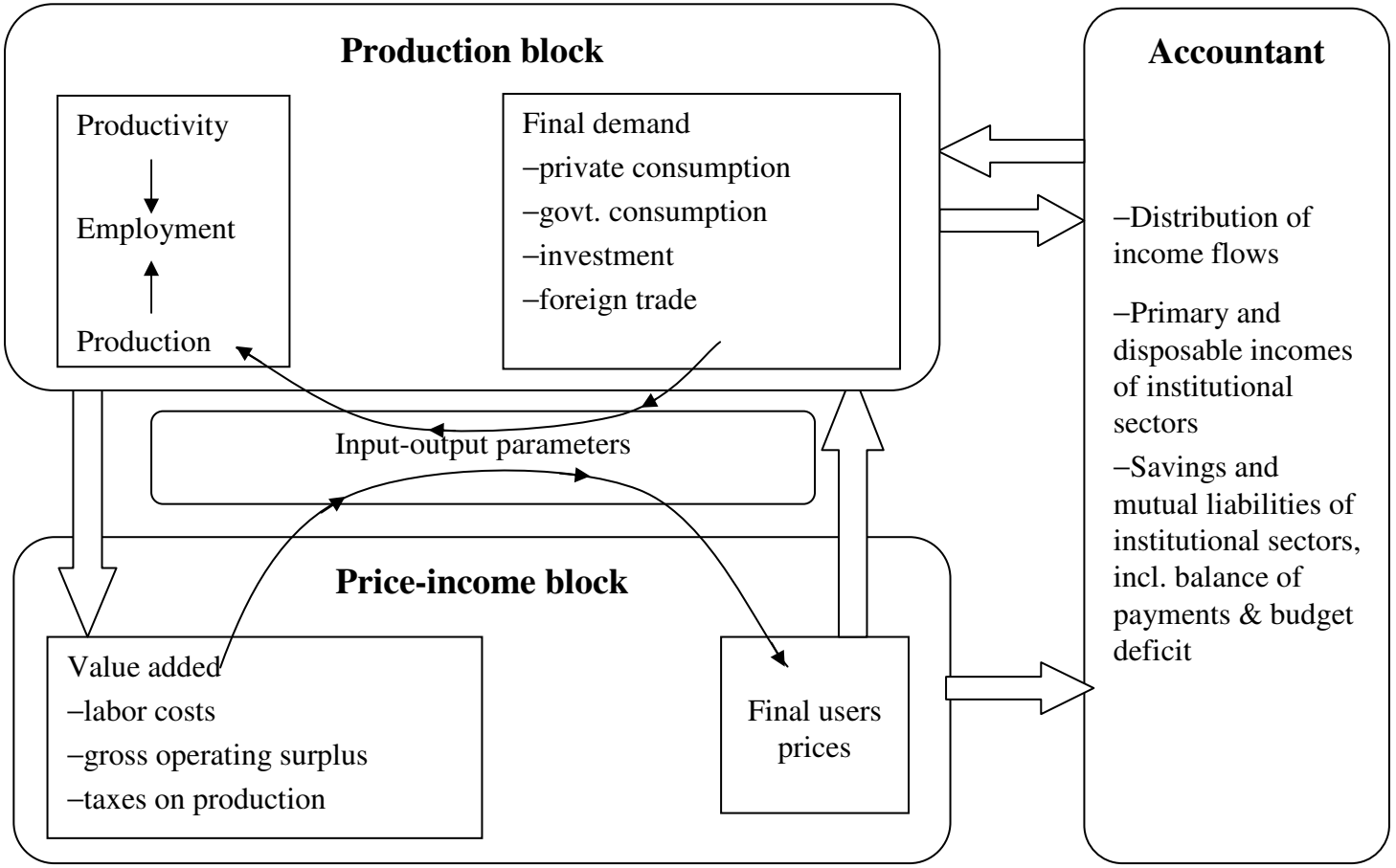
Energy in the Polish economy

Structure of fuels used for electric power generation in Poland



Model

Blocks of the IMPEC model



Model

Data used:

- io tables of 2000, 54 sectors of economy (divisions of NACE classification)
- io matrix in base prices (domestic and import)
- io matrix in purchasers prices (to determine taxes and margins)
- Make and use tables 1995-2006, 37 sectors (sections and subsections of NACE)

Stochastic equations

- PCE
- labor productivity
- wages
- operating surplus
- deviations in output and prices

Model

Specification of some equations

Labor productivity 45 sectors

$$\ln labprt_t = \alpha_0 + \alpha_1 timet_t + \alpha_2 timetYYYY_t + \alpha_3 outRdown_t + \alpha_0 outRup_t + \varepsilon_t$$

where
timet and *timetYYYY* – time trend variable

$$outRdown_t = \begin{cases} \ln outR_t - \ln outRpeak_{t-1} & \text{if } outR_t < outRpeak_{t-1} \\ 0 \text{ if } outR_t \geq outRpeak_{t-1} \end{cases}$$

$$outRup_t = \begin{cases} \ln outR_t - \ln outRpeak_{t-1} & \text{gdy } outR_t > outRpeak_{t-1} \\ 0 \text{ if } outR_t \leq outRpeak_{t-1} \end{cases}$$

$$outRpeak_t = \begin{cases} outR_t \text{ if } outR_t > outRpeak_{t-1} \\ outRpeak_t \text{ if } outR_t \leq outRpeak_{t-1} \end{cases}$$

Model

Specification of some equations

Labor costs (wages) 37 sectors

$$\ln \hat{wagavgtot}_t = 6{,}143 + 0{,}888 \ln pc_{t-1} + 0{,}304 \ln labprttot_t + 0{,}697 \frac{1}{un_t}$$

- where
- *wagavgtot* – average wage
- *pc* – CPI
- *labprttot* – labor productivity
- *un* – unemployment rate

$$wagavg_{it} = \alpha_0 + \alpha_1 wagavgtot_t + \varepsilon_{it}$$

Model

Specification of some equations

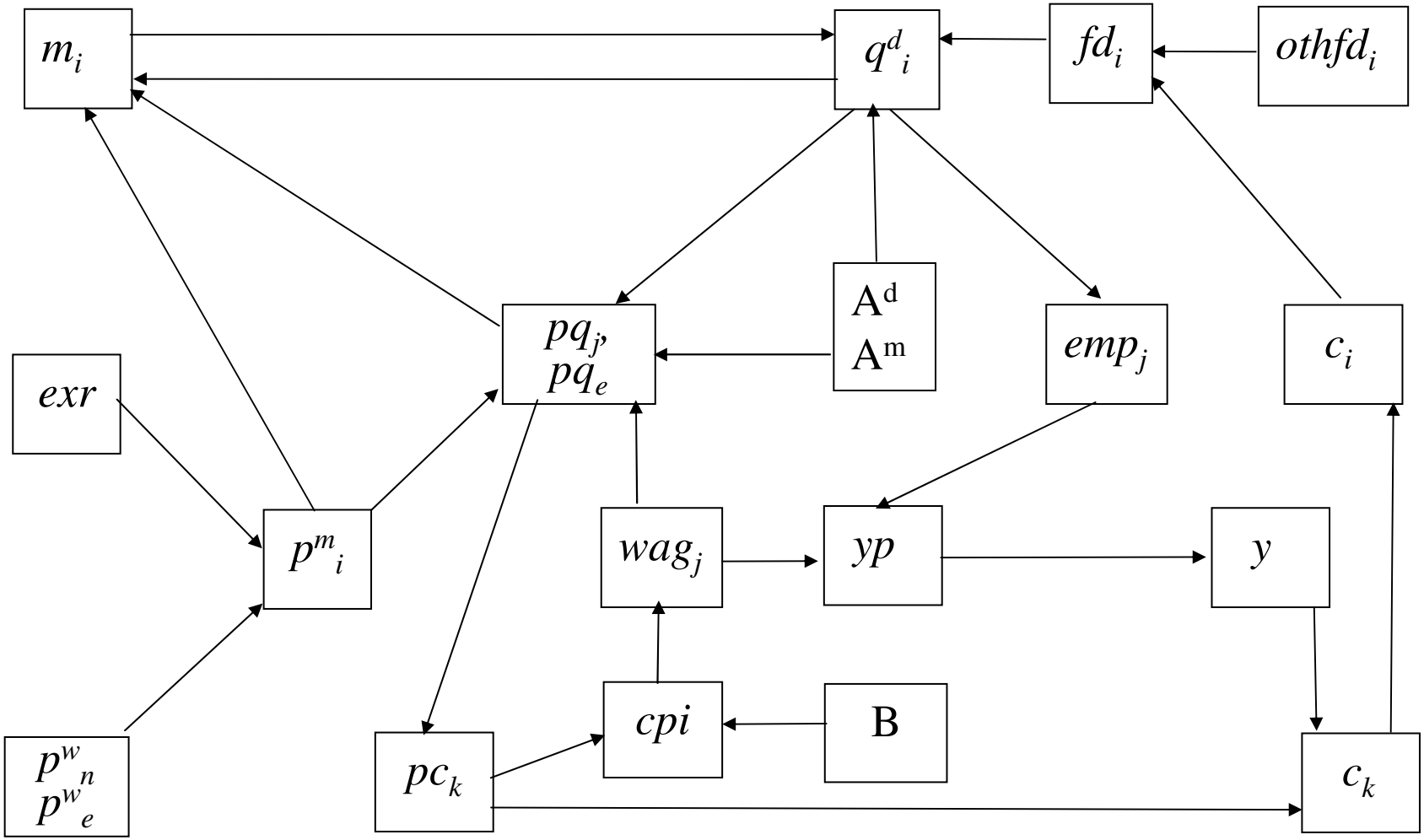
Operating surplus

$$\Delta markup_t = \alpha_0 + \alpha_1 \Delta outRT_t + \alpha_2 \Delta wagmark_t + \alpha_3 markup_{t-1} + \\ + \alpha_4 outRT_{t-1} + \alpha_5 wagmark_{t-1} + \varepsilon_t$$

where
outRT growth rate of real uutput (outR)
wagmark – ratio of labor costs and material costs (both in current prices)

Model

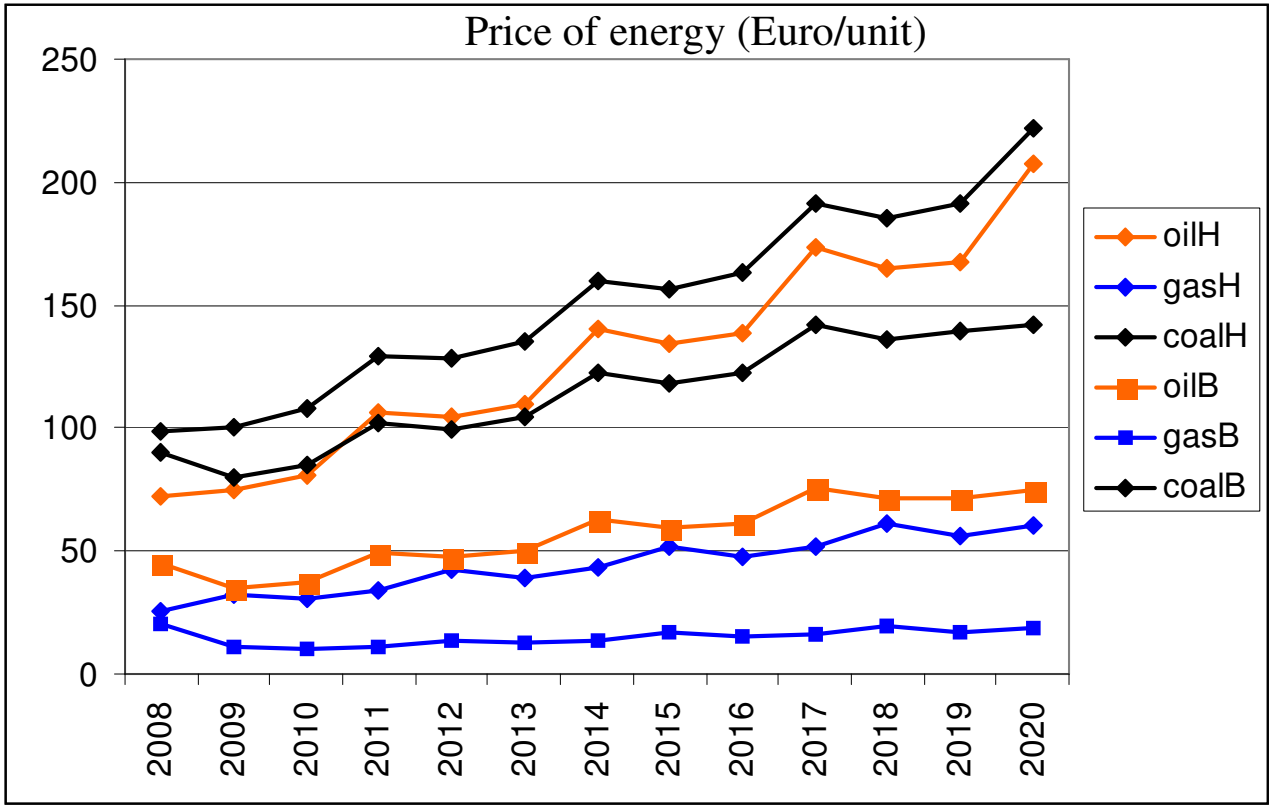
Spreading changes of energy prices over the economy



Assumptions for simulations

Simulation period
2008 - 2020

- Base scenario
- High growth
- Frozen
- Renevables frozen



Mel30i – increase of domestic price of electric power

Mcoal30i – increase of domestic price of coal by 30% in 2010

Moil50i – increase of crude oil price by 50% in 2010

Results – base scenario (growth rates)

	2009-10	2010-12	2012-14	2014-16	2016-18	2018-20	2009-20
GDP	2.7	7.2	4.6	3.4	2.3	1.9	3.8
Unemployment rate	-0.9	-20.4	-25.3	-13.9	4.7	2.1	-9.7
Output (deflators)	1.8	1.1	3.2	1.8	2.6	2.5	2.2
CPI	1.9	1.5	3.3	1.9	2.7	2.5	2.3
Average wage	5.6	3.1	3.5	3.2	3.7	2.9	3.5
Real income (households)	2.1	5.0	4.0	2.9	1.9	1.9	3.0
Imports	5.0	10.0	8.1	6.3	5.5	5.1	6.8
Exports	1.4	6.9	5.6	6.8	6.5	6.6	6.0
Private consumption	2.9	4.6	3.8	3.1	2.4	2.4	3.2
NGI consumption	2.6	3.4	1.8	0.9	0.5	0.9	1.6
Goverment consumption	2.6	3.4	1.8	1.0	0.5	0.9	1.6
Investments	6.8	18.3	10.7	6.2	4.0	2.4	8.2
Output	2.9	7.4	4.7	3.6	2.5	2.0	3.9
Employment	0.0	2.4	1.9	0.6	-0.3	-0.2	0.8
Labor productivity	2.9	5.0	2.8	3.0	2.7	2.2	3.1

Results – multipliers (percentage deviations from baseline)

	2010	2011	2012
GDP			
Mel30i	-1.685	0.034	0.008
Mcoal30i	-0.781	0.019	0.004
Moil50i	-0.974	0.029	0.005
CPI			
Mel30i	5.634	-0.306	-0.076
Mcoal30i	2.113	-0.153	-0.076
Moil50i	2.973	-0.229	-0.076
Average wage			
Mel30i	3.313	2.050	-0.150
Mcoal30i	1.218	0.764	-0.074
Moil50i	1.736	1.070	-0.103
Real income (households)			
Mel30i	-0.986	-0.151	0.004
Mcoal30i	-0.495	-0.072	0.003
Moil50i	-0.738	-0.097	0.004
Private consumption			
Mel30i	-0.421	-0.095	0.001
Mcoal30i	-0.238	-0.047	0.001
Moil50i	-0.424	-0.064	0.002

Results – scenario analysis (deviations from growth rates)

	2009-10	2010-12	2012-14	2014-16	2016-18	2018-20	2009-20
GDP							
high	-0.1	-0.2	-0.2	-0.1	-0.2	-0.5	-0.2
frozen	0.2	0.3	0.4	0.0	0.3	0.1	0.2
Unemployment rate							
high	1.8	3.7	9.6	9.4	-2.8	2.6	4.2
frozen	-0.6	-3.7	-8.3	-8.2	-8.6	1.3	-5.1
CPI							
high	0.1	0.5	0.4	-0.1	0.6	1.2	0.5
frozen	-0.5	-0.9	-1.1	0.2	-0.6	-0.2	-0.5
Real income (hholds)							
high	-0.2	-0.4	-0.3	-0.3	-0.1	-0.5	-0.3
frozen	0.1	0.4	0.4	0.1	0.4	0.1	0.3
PCE							
high	-0.1	-0.2	-0.2	-0.2	-0.1	-0.3	-0.2
frozen	0.1	0.2	0.2	0.0	0.2	0.0	0.1

Conclusions

- Poland uses relatively low ammunt of energy
- The share of Poland in world energy use is decreasing (but not in Europe)
- Coal is a very imortant energy source for Poland so EU E policy influence Polish economy in a large extant
- The most important energy source in Poland is coal, used mainly in power plants
- IMPEC model of the Polish econmy is rebuilt
- Simulations show that high energy prices cause noticeable loss of 0.2 p.p. of GDP growth
- Multiplier analyses showed that IMPEC dynamic features should be improved