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Forecasting of employment in Russian interindustry model

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ИНП РАН

The problem definition

- The growth of investment activity resulted in increase the production scale requiring the additive production resources,
- Total population declines resulted in reduction the population of working age, the basic state of formation the labor force supply,
- The labor force constrains could prevent further expansion of production potential,
- The problem can be solved by two ways: by increasing the labor productivity and by involving in production process unengaged labor force including foreign workers.

The main foundation of work

The set of tools:

- Quarter model (QUMMIR)
- Dynamic inter-industry model (RIM)
- Inter-industry model (CONTO)

The set of data:

- The series of input-output tables in current and constant prices for 44 economic activities structure since 1980 to 2006
- The series of investment in fixed capital in constant prices
- The series of sector employment

Model QUMMIR: **the block of labor force and demography in inter-industry models was based upon the same in the quarter model. Indeed the QUMMIR model allows to estimate the main elasticity and calculate the number of additional parameters using in CONTO compilation**

Model RIM (statistic base): **calculation of the regressions for employment (in 44 economic activities structure)**

Model CONTO: **the building of conforming forecast of the main macroeconomic characteristics to 2030. The calculation is performed on iterative procedures routing thought a process modified inter-industry model solution**

The main explanatory variables

- Production factors (endogenous)
- The industrial gross output in constant prices
- The investment in fixed capital in constant prices
- The relative industrial wages for employee
- The relative industrial prices

- Demographic factors (exogenous)
- The population of working age
- The economically active population (labor force)

The example of the equation
(the oil-extracting industry)

$$emp2 = -2.06 + 0.03*poptrudT - 0.004*kv2$$

emp2 – the sector employment (mln. person),

poptrudT – the population of working age (mln. person),

kv2 – the investment in fixed capital in constant prices (ths. rub.)

```
SEE   =       0.02 RSQ   = 0.8568 RHO =  -0.30 Obser  =    9 from 1998.000
SEE+1 =       0.01 RBSQ  = 0.8091 DW  =   2.60 DoFree =    6 to   2006.000
MAPE  =       3.83
Variable name          Reg-Coef  Mexval  Elas   NorRes     Mean          Beta
0 emp2                    - - - - - - - - - - - - - - - - - 0.35 - - -
1 intercept            -2.06270    80.6  -5.85    6.98     1.00
2 poptrudT              0.02789    95.8   6.99    1.19    88.33    1.159
3 kv2                  -0.00014     8.9  -0.14    1.00   358.31   -0.297
```

The example of the equation
(food industry)

$$emp7 = 0.02*poptrudT + 0.09*out7\_p - 0.002*time - 0.112*dum7$$

emp7 – the sector employment (mln. person),

out7_p – the industrial gross output (ths. rub.),

time – the time variable,

dum7 – the dummy variable, has 1 in 1998.

```
SEE   =       0.03 RSQ   = 0.9035 RHO =   0.07 Obser  =   27 from 1980.000
SEE+1 =       0.03 RBSQ  = 0.8860 DW  =   1.86 DoFree =   22 to   2006.000
MAPE  =       1.11
   Variable name          Reg-Coef  Mexval  Elas   NorRes     Mean   Beta
0 emp7                - - - - - - - - - - - - - - - - - -      1.60 - - -
1 poptrudT               0.01884   463.5   1.01   21.49     85.34
2 outR7_p                0.09269     8.6   0.06   16.44      0.97  0.203
3 dum7                  -0.11219    23.7  -0.00    1.04      0.04 -0.240
5 time                  -0.00200     2.0  -0.02    1.00     13.00 -0.176
```

The main exogenous variables (average annual index, mln. person)

	2005-2010	2010-2015	2015-2020	2020-2025	2025-2030
Total population	142.00	141.10	140.34	139.36	137.61
The population of working age	90.00	88.55	86.10	83.63	81.23
The working population of under and over working age	2.78	3.19	2.99	2.87	2.80
Foreign workers	1.90	3.37	4.17	4.66	4.95
Employment	70.73	71.35	70.40	69.20	67.89
Unemployment	3.36	3.86	3.52	3.17	2.84

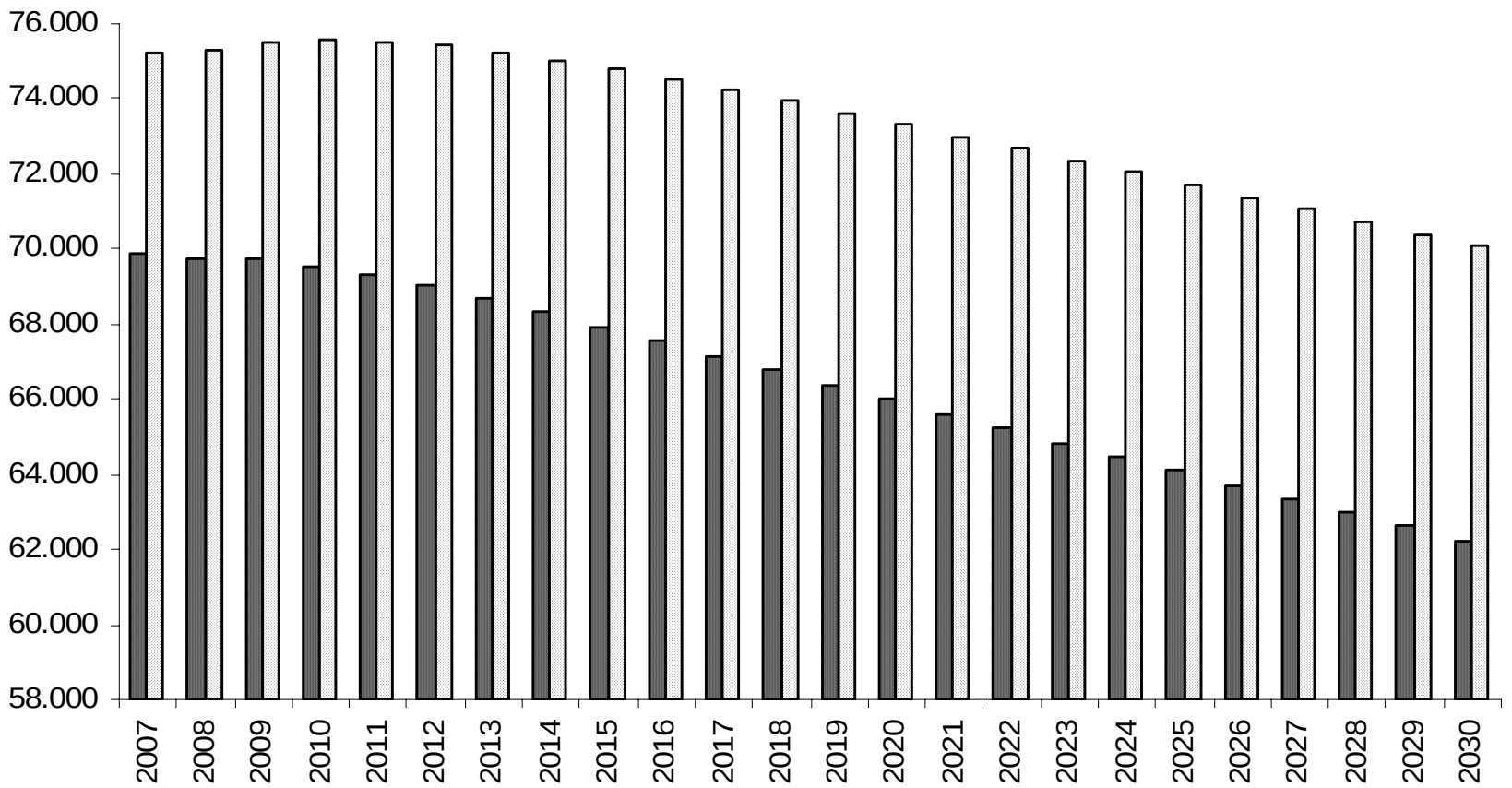
The growth rate of GDP and the main components of final demand,%

	2006-2010	2011-2015	2016-2020	2021-2025	2026-2030
Household consumption	*12.5*	*11.2*	*9.6*	*7.7*	*5.7*
Government consumption	*5.0*	*4.7*	*4.4*	*4.0*	*3.6*
Capital investment	*16.0*	*13.6*	*11.3*	*7.8*	*4.3*
Export	*6.1*	*5.8*	*5.7*	*6.3*	*10.1*
Import	*20.2*	*16.0*	*12.1*	*8.3*	*5.4*
GDP	*7.0*	*6.4*	*6.2*	*6.1*	*6.7*

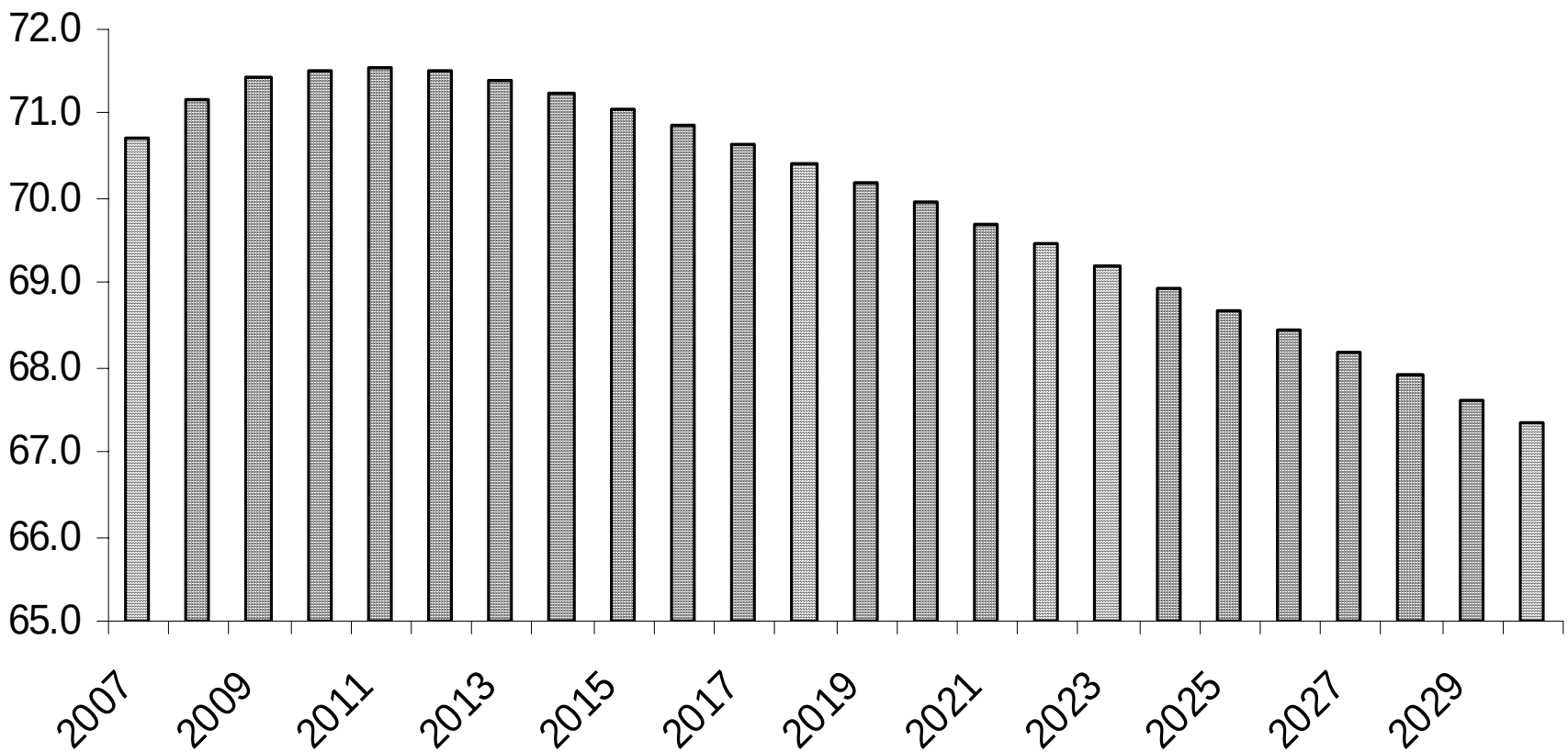
The growth rate of industrial sectors production,%

	2005-2010	2010-2015	2015-2020	2020-2025	2025-2030
Production sector	*7.1*	*6.9*	*6.7*	*6.6*	*8.3*
Construction	*13.0*	*11.1*	*9.8*	*7.4*	*5.1*
Agriculture	*3.9*	*3.9*	*3.8*	*3.8*	*3.8*
Service industries (including trade)	*8.3*	*7.7*	*7.1*	*6.3*	*5.8*

The economically active population of working age and total value of economically active population (mln. person)



Employment
(mln. person)



The growth rate of the sector employment, %

	2005-2010	2010-2015	2015-2020	2020-2025	2025-2030
Production sector	*0.9*	*1.2*	*1.6*	*1.2*	*3.0*
Construction	*-3.8*	*0.8*	*1.2*	*1.3*	*1.2*
Agricultire	*-9.0*	*-0.2*	*0.9*	*1.1*	*1.1*
Service industries (including trade)	*4.0*	*-0.6*	*-1.3*	*-1.4*	*-2.4*

The growth rate of the sector labor productivity, %

	2005-2010	2010-2015	2015-2020	2020-2025	2025-2030
Production sector	*3.4*	*6.0*	*7.1*	*11.3*	*10.3*
Construction	*13.9*	*10.3*	*8.5*	*6.0*	*3.9*
Agriculture	*10.9*	*4.0*	*2.9*	*2.7*	*2.6*
Service industries (including trade)	*6.7*	*7.6*	*7.5*	*7.4*	*8.9*

Thanks for your attention