A dynamic model of economy with social stratification

Nicholas Olenev$^{1,2}$

$^1$ Dorodnicyn Computing Centre of RAS, Moscow, Russia; nolenev@yahoo.com  
$^2$ People’s Friendship University of Russia, Moscow, Russia;

The paper presents a method of identification for a dynamic model of economic growth with social stratification. The model is a modification of a model presented in [1]. Here for describe an economic model for a stratum it is used the Uzawa-Lucas model [2-4] on the data of Russian economic statistics by application of high performance computations on multi-processors systems [5-7].

An optimal control problem for a typical household of a stratum dynasty can be formulated by the following way:

$$
\int_0^\infty e^{-\rho t}(\ln c + \phi \ln n + \psi \ln N)dt \rightarrow \max_{u,c,n}
$$

(1)

$$
\dot{h} = B(1-u)h,
$$

(2)

$$
\dot{N} = (n - M \mu(h))N,
$$

(3)

$$
\dot{k} = Ah^{\gamma}k^{\alpha}(uh)^{1-\alpha} - (n - M \mu(h) + \delta)k - c - qnh,
$$

(4)

Here the control variables are a part of time for job $u(t)$, per capita consumption $c(t)$, and the number of children defined by fertility $n(t)$. State variables are the physical capital $k(t)$, the human capital $h(t)$, the size of dynasty $N(t)$, mortality $m(t) = M \mu(h)$, $\mu'(h) < 0$, $\mu(0) = \mu_+ > \mu(\infty) = \mu_- > 0$. Parameters are the discount rate $\rho > 0$, the utility weights $\phi$ and $\psi$, the intensity of schooling $B > 0$, the depreciation rate of physical capital $\delta > 0$, the technological level $A > 0$, the exponent $\gamma \geq 0$, the output elasticity of physical capital $0 < \alpha < 1$ in production, the cost of child rearing $q > 0$. 

1
GDP for the whole economy, the population and the value the average human capital are determined as sum of all strata $S$.

$$\begin{align*}
Y_a &= \sum_{i=1}^{S} y_i N_i, \\
N_a &= \sum_{i=1}^{S} N_i, \\
h_a &= \sum_{i=1}^{S} h_i N_i / N_a,
\end{align*}$$

(5) (6) (7)

The author of the work was supported by the Russian Foundation of Basic Research (project no. 13-07-01020).

REFERENCES