# Assessing the Impact of the Maternity Capital Policy in Russia Using a Dynamic Stochastic Model of Fertility and Employment

Fabián Slonimczyk Anna Yurko

ICEF – Higher School of Economics Moscow

IZA-HSE Workshop: Labor Market Adjustment in the Wake of the Great Recession. October 2012

## Fertility and Economic Incentives

- For decades now, fertility has been related to women's labor supply decisions
  - 1 Static models: Becker (1968), Willis (1974)
  - 2 Life cycle models: Hotz & Miller (1988), Eckstein & Wolpin (1989)
- A more recent phenomenon is the explicit use of economic incentives by governments concerned with demographic trends
  - Australia, France, Germany, the province of Quebec in Canada, and Spain have all offered "baby bonuses" to couples

# Russia's Demographic Crisis

- Russia's TFR over the period 2001–2005 was only 1.3
- To encourage women to have more children, the State Duma passed a law in December of 2006 establishing new measures of government support for families with children
- Maternity Capital (MC)

# Maternity Capital Policy

- Starting in January 2007, women that give birth to or adopt a second or consecutive child are entitled to special financial assistance
- Program scheduled to expire by the end of 2016
- Assistance consists of a certificate that entitles its holder to receive funds (\$11,000) at any time after the child reaches the age of three
- Women can apply for MC funds only once in their lifetimes and the money can be used for a limited number of purposes:
  - Acquiring housing
  - 2 Paying for children's education
  - Investing in the mother's retirement fund

#### Overview

- We estimate a dynamic stochastic discrete choice model of fertility and employment
  - Women are forward looking and make decisions in order to maximize their expected discounted lifetime utility
  - The MC policy enters the model through the budget constraint
  - Estimation based on maximum simulated likelihood
- We simulate alternative policy scenarios
- Preliminary findings
  - 1 The MC policy does not seem to have had a strong impact on fertility
  - Women in Russia are sensitive to economic incentives, so a well-designed pro-natalist policy should be effective
  - 3 The design of the MC policy, in particular the fact that it can only be used for specific purposes, deems it ineffective

#### Outline

- 1 The Model
  Model Solution and Estimation
- 2 Data Description
- 3 Estimation Results
  Model Fit
- 4 Simulations and Preliminary Conclusion

Women choose among discrete alternatives at each point in time

$$j = \begin{cases} 1 & \text{if no birth and no work} \\ 2 & \text{if no birth and work} \\ 3 & \text{if birth and no work} \\ 4 & \text{if birth and work} \end{cases}$$

- Only full-time work is considered
- Fertility decisions are deterministic. Fertile period ends at age 40
- The decision process start at age 22 and ends at the official retirement age of 55

The woman's objective function can be written

$$E\left[\sum_{t=22}^{54} \rho^{t-22} U_t(c_t, l_t, n_t, X_{t-1}, N_t, B_t, S, m_t)\right]$$

- Marital status evolves following a first-order markovian process
   Table Transitions
- The specific functional form for the utility function is

$$U_{t} = c_{t} + \alpha_{1}l_{t} + (\alpha_{2} + \epsilon_{t}^{n}) n_{t} + \alpha_{3}I_{N_{t}=1} + \alpha_{4}I_{N_{t}=2} + \alpha_{5}I_{N_{t}>2}$$

$$+ \beta_{1}c_{t}l_{t} + \beta_{2}c_{t}n_{t} + \beta_{3}l_{t}n_{t}$$

$$+ (\delta_{1}n_{t} + \delta_{2}l_{t} + \delta_{3}I_{N_{t}=1} + \delta_{4}I_{N_{t}=2} + \delta_{5}I_{N_{t}>2} + \delta_{6}l_{t}n_{t}) m_{t}$$

$$+ (\gamma_{1}X_{t-1} + \gamma_{2}S_{1} + \gamma_{3}S_{2} + \gamma_{4}S_{3} + \gamma_{5}S_{4}$$

$$+ \gamma_{6}I_{N_{t}=1} + \gamma_{7}I_{N_{t}=2} + \gamma_{8}I_{N_{t}>2} + \gamma_{9}B_{t})l_{t}$$

The budget constraint is written:

$$c_t = y_t^f l_t + y_t^o + (\phi_1 + \phi_2 H) M C n_t K$$
$$-b_1 l_t - b_2 n_t - b_3 I_{N_t=1} - b_4 I_{N_t=2} - b_5 I_{N_t>2}$$

• Women receive labor income  $y_t^f$  when employed and income from other household members  $y_t^o$ , including the spouse's income when married

$$\overline{\log y_t^o} = c_0 + c_1 m_t + c_2 t + c_3 t^2 + c_4 S_1 + c_5 S_2 + c_6 S_3 + c_7 S_4$$

► Other Income Regression

 The earnings offer function depends on the woman's accumulated human capital:

$$\log y_t^f = a_0 + a_1 X_{t-1} + a_2 X_{t-1}^2 + a_3 S_1 + a_4 S_2 + a_5 S_3 + a_6 S_4 + \epsilon_t^y$$

- The two shocks  $(\epsilon_t^n, \epsilon_t^y)$  are jointly normally distributed with zero mean, finite variance, and non-zero contemporaneous covariance
- The shocks are assumed to be serially independent, so past realizations do not provide information on the future
- Unobserved individual heterogeneity
  - utility of giving birth  $(\alpha_2, \delta_1)$
  - utility associated with having children  $(\alpha_3, \alpha_4, \alpha_5, \delta_3, \delta_4, \delta_5)$
  - baseline earnings (a<sub>0</sub>)

#### Solution and Estimation

- For given parameter values, the solution to the finite-horizon dynamic programming problem is found using backward recursion
- Letting  $d_{i,t}$  denote the combination of the choice and earnings, we have

$$\begin{aligned} \Pr(d_{i,t} \mid \Omega_t^d) = & \Pr\left(j = \arg\max_k V_k(\Omega_t)\right) & \text{for } j = 1, 3 \\ \Pr(d_{i,t} \mid \Omega_t^d) = & \Pr\left(j = \arg\max_k V_k(\Omega_t)\right) \\ & \times \Pr\left(y_t^f \mid j = \arg\max_k V_k(\Omega_t)\right) & \text{for } j = 2, 4 \end{aligned}$$

 We generate the probabilities in the right hand side by solving the dynamic program for 20 simulations of the random shocks

#### Solution and Estimation

 Given the serial independence of the shocks, the joint probability of a sequence of choices is

$$\Pr(d_{i,22},\ldots,d_{i,54} \mid \Omega_{22}^d) = \prod_{t=22}^{34} \Pr(d_{i,t} \mid \Omega_t^d)$$

 The introduction of unobservable types into the model modifies the objective likelihood function as follows

$$\mathrm{L}_i(oldsymbol{ heta}) = \sum_{h=1}^{H} \mu_h \prod_{t=22}^{54} \mathrm{Pr}(d_{i,t} \mid \Omega_t^d, \mathsf{type} = h)$$

#### The Data

- The Russian Longitudinal Monitoring Survey
  - Rounds XIII–XIX (2004–2010)
  - In typical round, 10,000 individuals in 4,000 household
  - We use the family roster to create a fertility history for each woman in the panel
  - The adult questionnaire contains information on employment, earnings, and other characteristics
- Sample is composed of women ages 22–54 and observed at least 3 times during the period
- Unbalanced panel of 2,031 individuals and 12,117 person-year observations

#### Variable Definitions

- Employment: A woman is considered employed if she usually works 10 or more hours per week at all jobs
- Experience: Data used to determine experience in the first interview. We let experience evolve in a way that is consistent with the observed employment history
- Births: Determined on the basis of the household roster
- Number of Children: Data used to determine the number of children in the first interview. Evolution consistent with birth history
- Marital Status: We consider a woman as married when there is a cohabiting spouse in the household roster

# Comparing Rosstat and RLMS data

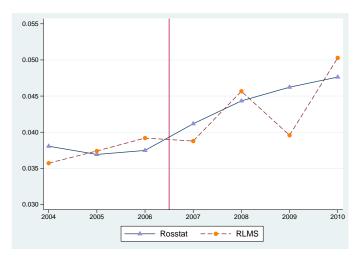


Figure: Birth Rates for Women Ages 15-49

#### Maximum Likelihood Estimates

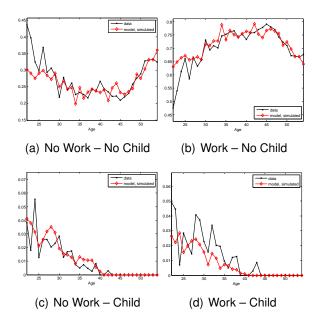
$$\begin{split} U_{t} = & c_{t} + \alpha_{1}l_{t} + (\alpha_{2} + \epsilon_{t}^{n}) n_{t} + \alpha_{3}I_{N_{t}=1} + \alpha_{4}I_{N_{t}=2} + \alpha_{5}I_{N_{t}>2} \\ & + \beta_{1}c_{t}l_{t} + \beta_{2}c_{t}n_{t} + \beta_{3}l_{t}n_{t} \\ & + (\delta_{1}n_{t} + \delta_{2}l_{t} + \delta_{3}I_{N_{t}=1} + \delta_{4}I_{N_{t}=2} + \delta_{5}I_{N_{t}>2} + \delta_{6}l_{t}n_{t}) m_{t} \\ & + (\gamma_{1}X_{t-1} + \gamma_{2}S_{1} + \gamma_{3}S_{2} + \gamma_{4}S_{3} + \gamma_{5}S_{4} \\ & + \gamma_{6}I_{N_{t}=1} + \gamma_{7}I_{N_{t}=2} + \gamma_{8}I_{N_{t}>2} + \gamma_{9}B_{t})l_{t} \end{split}$$

$$\log y_t^f = a_0 + {\color{red}a_1 X_{t-1} + a_2 X_{t-1}^2 + a_3 S_1 + a_4 S_2 + a_5 S_3 + a_6 S_4 + \epsilon_t^y}$$

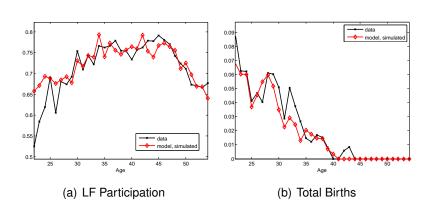
$$c_t = y_t^f l_t + y_t^o + (\phi_1 + \phi_2 H) M C n_t K$$

•  $\alpha_1$ , the disutility of work, is negative as expected. In

#### Predicted vs. Actual Behavior



#### Predicted vs. Actual Behavior



# Data versus Model: Analysis by Type

	Births (per 1,000)	Participation Rate	
Type 1	13.7597	0.9802	
турет	9.1318	0.9892	
Type 2	34.0408	0.1005	
Type Z	34.5695	0.1072	
Type 3	19.0583	0.7722	
Type 3	16.5762	0.7759	
All	19.8894	0.7224	
All	17.1140	0.7289	

Note: Gray cells contain model predictions based on 200 simulations.

# **Simulations**

	Births (per 1,000)	Participation Rate	N avg.	X avg.
Baseline model	22.584	0.645	1.186	22.428
MC policy efficacy $(\phi_1)$				
0.1	+16.367	-0.012	+0.594	-0.413
0.5	+21.055	-0.021	+1.007	-0.721
1	+15.565	-0.027	+1.025	-0.941
Net utility of birth $(\alpha_2)$				
+5000	+14.434	-0.014	+0.524	-0.448
+10000	+23.836	-0.024	+0.896	-0.780
Net utility from children $(\alpha_3 - \alpha_5)$				
+500 (per child)	+19.670	-0.025	+0.758	-0.833
+1000 (per child)	+28.461	-0.041	+1.193	-1.334

# **Simulations**

	Births (per 1,000)	Participation Rate	N avg.	X avg.
Baseline model	22.584	0.645	1.186	22.428
Mean earnings $(a_0)$ +10% +30%	-0.319 $-0.939$	+0.000 +0.008	-0.013 $-0.035$	$-0.002 \\ +0.275$
Earnings, return to experience $(a_1)$ +1 percentage point +3 percentage points	-0.623 $-1.501$	-0.014 $-0.009$	-0.022 $-0.050$	-0.490 $-0.313$
Mean other income $(c_0)$ +10% +30%	-0.084 $-0.071$	+0.000 -0.002	-0.003 $-0.004$	+0.003 -0.075
Utility of working with baby $(\gamma_9)$ $+1000$ $+5000$	$+3.448 \\ +17.622$	-0.003 $-0.011$	+0.123 +0.657	-0.096 $-0.280$
College graduates $+10\%$ $+30\%$	-1.812 $-2.834$	+0.063 +0.091	-0.068 $-0.104$	+2.054 +2.994

# **Preliminary Conclusion**

- The MC policy as currently applied is ineffective in increasing birth rates
- The underlying rationale for the policy —that fertility behavior responds to economic incentives— seems to be correct
- What would be necessary is a reformulation of the policy so that the incentives are actually perceived by economic actors
- However, a reformulation of the policy might be effective but undesirable if it fails to raise attained levels of utility for the population

# Assessing the Impact of the Maternity Capital Policy in Russia Using a Dynamic Stochastic Model of Fertility and Employment

Fabián Slonimczyk Anna Yurko

ICEF – Higher School of Economics Moscow

IZA-HSE Workshop: Labor Market Adjustment in the Wake of the Great Recession. October 2012

## **Marital Status Transitions**

Age	Transition Probabilities				
Group	$\Pr(m_t = 1 \mid m_{t-1} = 0)$	$\Pr(m_t = 0 \mid m_{t-1} = 1)$			
22–25	9.36	8.25			
26-30	16.36	4.78			
31–35	12.31	4.05			
36-40	5.19	3.6			
41-45	4.52	2.38			
46-50	4.47	3.05			
51–55	1.17	2.15			

◆ Back

# Log Non-labor Income Regression

	Coefficient	Standard Error
Married	0.966	0.020
Age	-0.022	0.009
Age Squared	0.001	0.0003
Secondary School	0.169	0.042
Vocational School	0.136	0.041
Technical School	0.144	0.040
University	0.452	0.041
Constant	10.114	0.173
Observations		11,359
R-squared		0.187

Note: OLS regression estimated on person-year observations with positive non-labor income.



# **Descriptive Statistics**

	Mean	Std Dev				
Individuals (2031 observations)						
Years in sample	6	1.2				
Age in 1st period	36	9.2				
Experience in 1st period	13	10.0				
Residence Owner	0.75					
Less than Secondary Educ	0.05					
Secondary Educ Complete	0.19					
Vocational School Complete	0.23					
Technical School Complete	0.31					
University Degree or above	0.22					
Person-year (12,117 o	bservatio	ns)				
Age	38.7	9.1				
Number of Children	1.4	0.9				
Experience	15.2	10.1				
Labor Income	2,446	2,846				
Other Income	5,909	11,857				
Married	0.69					
Birth	0.02					
Employed	0.72					
MC Eligible (2007–2010)	0.81					

# Employment by Marital Status and Number of Children

Number of	Unmarried		Married		All	
Children	Obs.	% Employed	Obs.	% Employed	Obs.	% Employed
0	1,108	66.0	649	64.4	1,757	65.4
1	1,640	78.2	3,281	76.9	4,921	77.3
2	856	80.7	3,362	74.5	4,218	75.8
3	128	62.5	803	53.1	931	54.4
4+	25	48.0	265	31.3	290	32.8
Total	3,757	74.4	8,360	71.2	12,117	72.2

## **Choice Distribution**

Age	Non-employed		Employed		Total
Group	No Birth	Birth	No Birth	Birth	
22-24	37.8	3.9	55.3	3.0	100
25-27	32.0	2.2	63.7	2.1	100
28-30	26.9	2.5	67.3	3.3	100
31-33	25.9	1.6	70.2	2.3	100
34-36	22.9	0.7	75.4	1.1	100
37-39	23.2	0.5	75.5	0.9	100
40-44	23.8	0.1	75.9	0.2	100
45-49	24.0	0	76.0	0	100
50-54	31.9	0	68.1	0	100
Total	26.87	0.92	71.14	1.07	100