

The Economic Impact of Chronic Diseases: Evidence for Brazil, India and Russia

Anderson E. Stanciole, *The University of York*

Dele O. Abegunde, *World Health Organization*

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Outline

Motivation

Econometric model

Data description

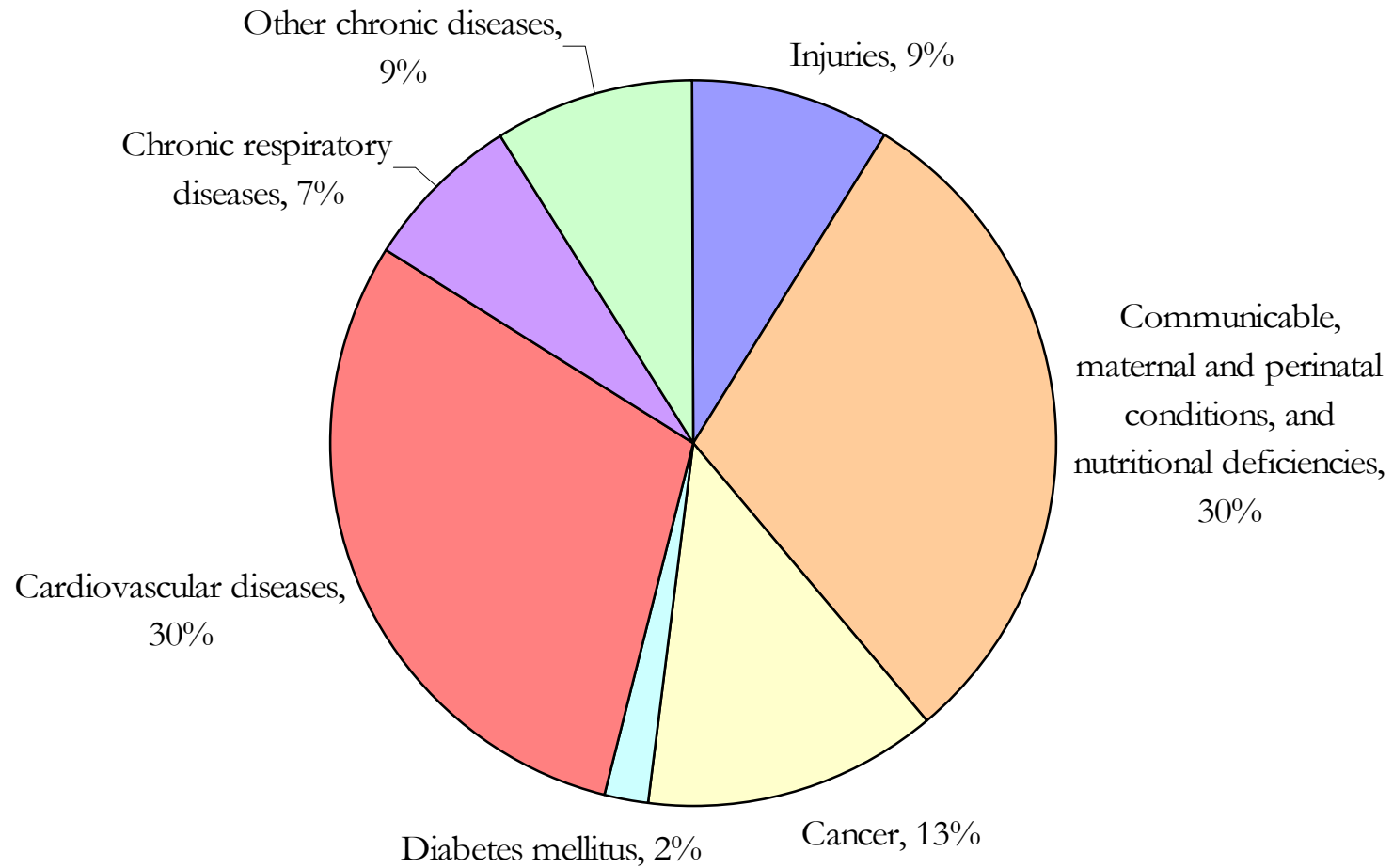
Results

Conclusion

Motivation

- Chronic diseases (CD) respond for 61% of the total mortality worldwide
- Persistent increase of the prevalence of chronic diseases in developing countries
- Risk factors: tobacco and obesity

Figure 1: Projected global distribution of total deaths (58 million) by major cause, 2005



Source: Strong, Mathers, Leeder and Beaglehole, 2005

Motivation

Two adverse consequences of diseases:

- **Direct costs:** resources used up because of the disease;
- **Indirect costs:** loss of economic output because people are unable to work.

Econometric model

Objective: To measure the impact of chronic disease in terms of:

- Health expenditures
- Non health related consumption
- Productivity losses
- Labour income
- Transfers and remittances

Data

- household data for Brazil, India and Russia (6 years)

Econometric model

- Consumption insurance against idiosyncratic shocks (Cochrane 1991, Besley 1995, Kochar 1995, Townsend 1995, Morduch 1995)
- Risk of illness (Sauerborn, Adams and Hein 1996, Schultz and Tansel 1997, Dercon and Krishnan 2000, Gertler and Gruber 2002, Das and Sanchez-Paramo 2003, Asfaw and von Braun 2004, Wagstaff 2005)

Econometric model

General guidelines

- Household as unit of analysis
- **Short** term x **long** term health shocks
 - Gertler & Gruber 2002, Wagstaff 2005
 - Implication for social insurance: Co-payments & deductibles + Catastrophic coverage

Econometric model

Difficulties in modelling health care expenditures:

Nontrivial proportion of zeros

- During a given period of time many households do not need medical attention

Skeweness and heteroscedasticity

- Most households spend relatively modest amounts; however, a small proportion will report very high levels of expenditure

Econometric model

Two part models

First part:

- binary outcome modelling the probability of incurring in any expenditure $\Rightarrow P[y > 0 \mid \mathbf{x}]$

Second part

- includes only observations with positive expenditures $\Rightarrow E[y \mid y > 0, \mathbf{x}]$

Joint effect

- $E[y \mid \mathbf{x}] = P[y > 0 \mid \mathbf{x}] \cdot E[y \mid y > 0, \mathbf{x}]$

Econometric model

Skewness and heteroscedasticity persist in the second part

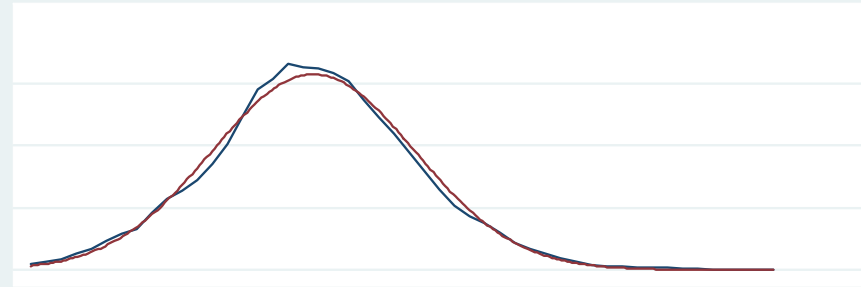
Solution: to stabilize the variance using a transformation on y

Two alternatives:

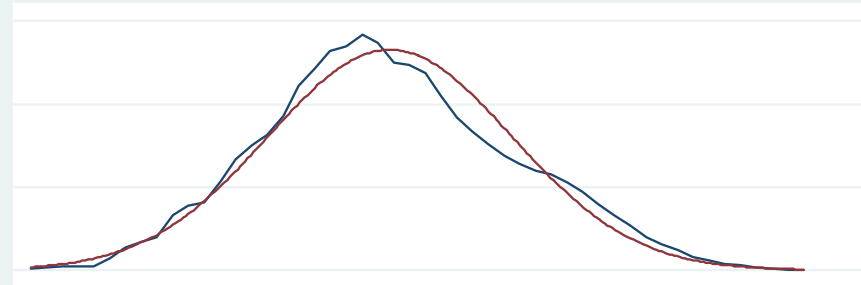
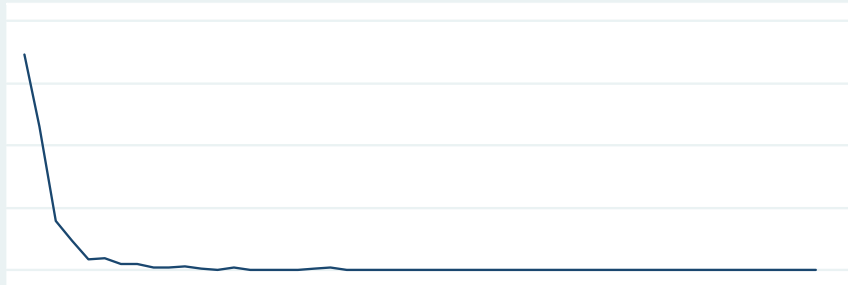
- OLS for $\ln(y)$
- Generalized Linear Models (GLM)

Density functions for y and $\ln(y)$

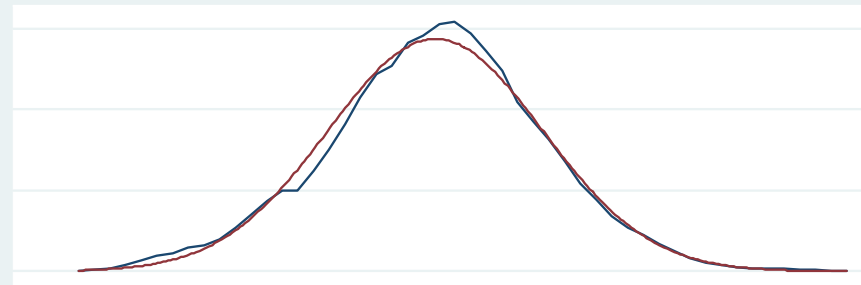
Brazil



India

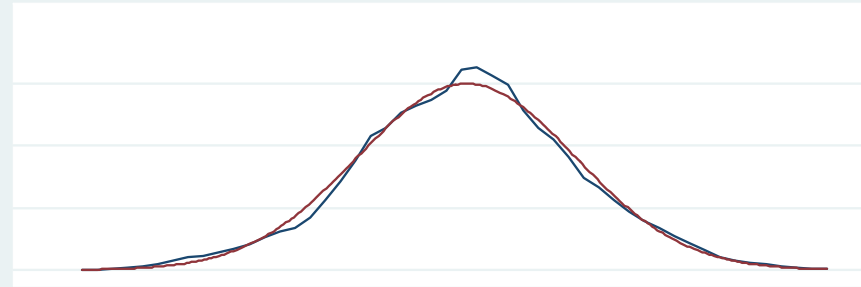
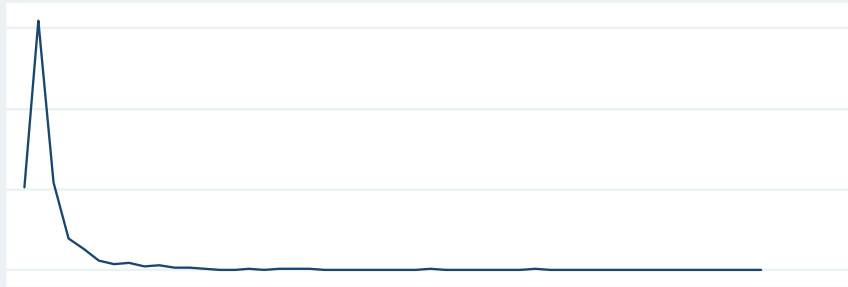


Round6

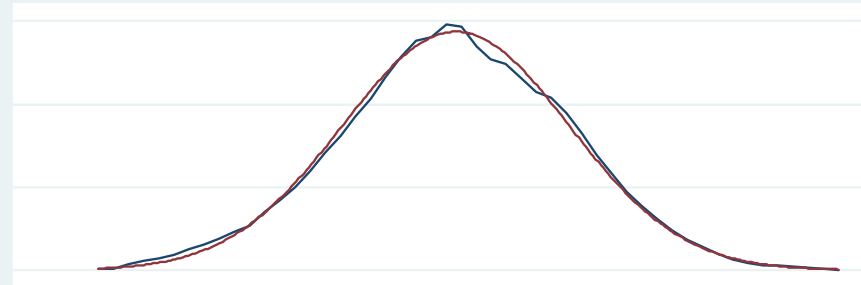


Density functions for y and $\ln(y)$

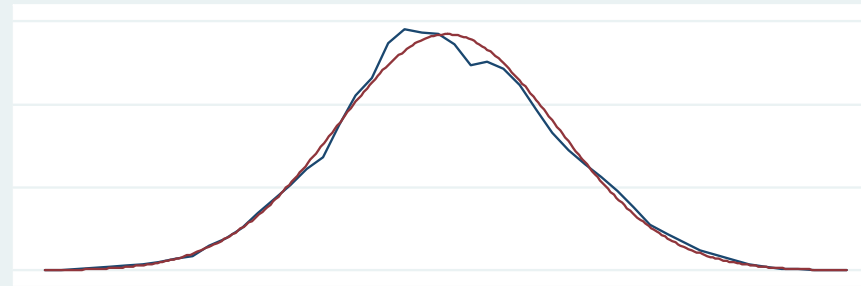
Round7



Round8

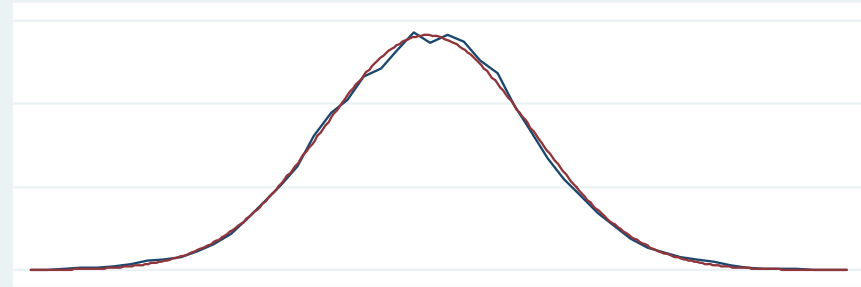


Round9

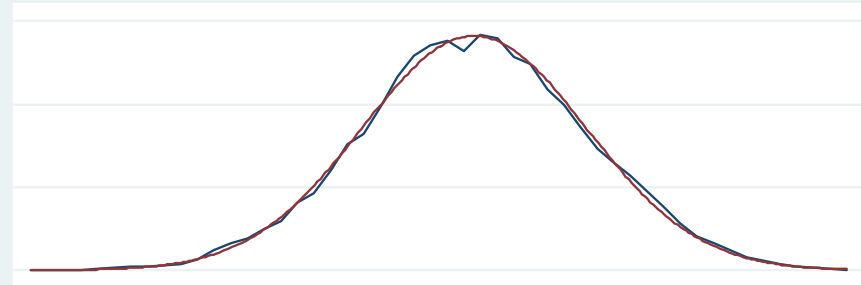
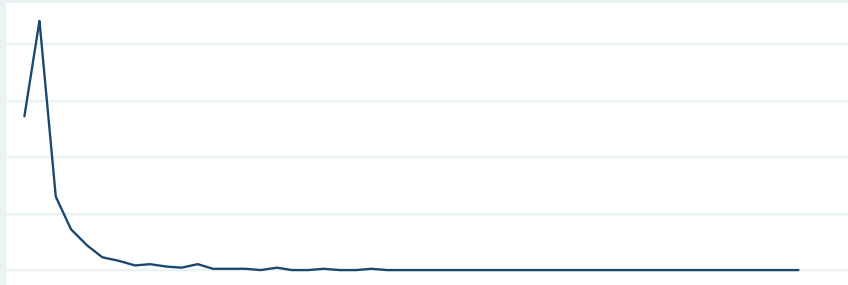


Density functions for y and $\ln(y)$

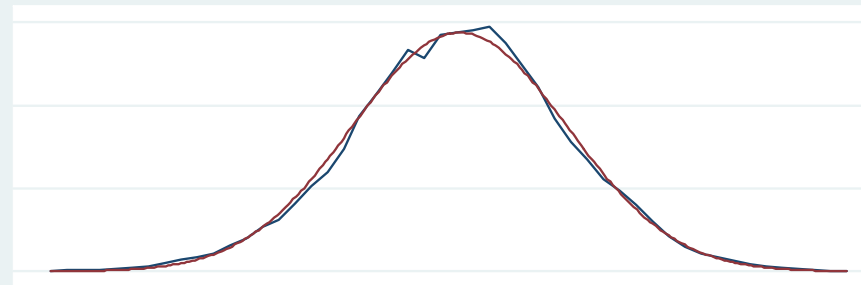
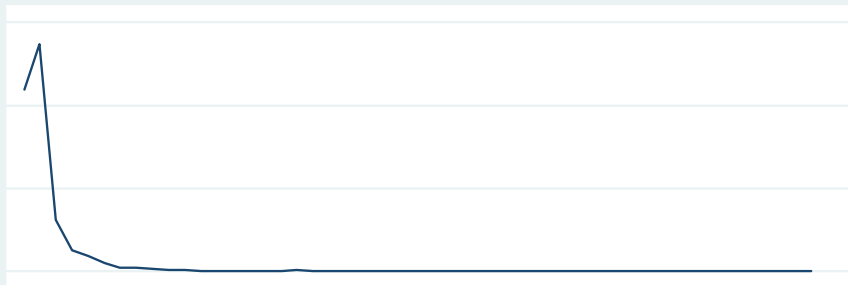
Round10



Round11



Round12



Data description

Source: Life Style Measurement Surveys (LSMS) performed by the World Bank in several developing countries

Data description

List of chronic diseases included:

- **Brazil:** heart problems, high blood pressure, diabetes, respiratory problems, digestive problems, gynaecological problems, prostate problems, allergy, cancer, bone/muscle/joint problems, neuro-psychiatric problems and high cholesterol
- **India:** respiratory problems, heart problems, blood pressure, cataract and permanent disability
- **Russia:** diabetes, infarction and stroke

Table A.1: Descriptive statistics of selected variables

Variable	Description	Brazil	India	Russia Panel	Round 9	Round 10	Round 11	Round 12
income	Household monthly income	984.28	2,147.44	6,818.48	5,418.28	6,368.95	7,205.54	8,057.52
dincome	=1 if income>0	0.97	0.86	0.99	0.99	0.99	0.99	0.99
earned	Household monthly income from work	658.39	2,059.38	4,433.26	3,554.87	4,242.07	4,765.15	5,037.17
dearned	=1 if earned>0	0.84	0.81	0.83	0.84	0.83	0.83	0.83
unearned	Household monthly income from other sources	325.89	88.06	2,891.83	2,276.20	2,507.08	2,980.10	3,693.78
dunearned	=1 if unearned>0	0.54	0.21	0.85	0.83	0.85	0.86	0.86
totmexp	Household monthly expenditure	590.55	2,617.79	8,219.28	7,049.17	8,030.46	8,329.47	9,288.48
dtotmexp	=1 if totmexp>0	1.00	1.00	1.00	1.00	1.00	1.00	1.00
healthexp*	Household monthly health expenditure	37.81	250.45	585.89	513.64	585.36	576.98	652.82
dhealthexp	=1 if healthexp>0	0.56	0.98	0.68	0.64	0.68	0.70	0.69
nonhealthexp	Household monthly non health expenditure	552.70	2,374.88	7,826.89	6,725.23	7,638.73	7,928.41	8,845.45
dnonhealthexp	=1 if nonhealthexp>0	1.00	1.00	1.00	1.00	1.00	1.00	1.00
headactiv	Number of days of activity lost by the head in the last 30 days	0.68	-	0.39	0.35	0.43	0.41	0.38
dheadactiv	=1 if headactiv>0	0.08	-	0.04	0.04	0.04	0.04	0.04
size	Total size of the household	4.12	6.64	2.74	2.78	2.74	2.73	2.72
headchronic	=1 if head reported chronic disease	0.24	0.04	0.22	0.22	0.23	0.22	0.22
headnonchronic	=1 if head reported non chronic disease	0.24	0.22	0.41	0.41	0.43	0.40	0.40
headbad	=1 if head reported bad health	0.06	-	0.18	0.20	0.18	0.18	0.18
manual	=1 if head works on manual activities	-	-	0.67	0.67	0.67	0.67	0.66
headwork	=1 if head currently works	0.72	1.00	0.40	0.41	0.41	0.40	0.39
headphysical	=1 if head engages in physical activities	0.19	-	-	-	-	-	-
headoverweight	=1 if head is overweight	0.37	-	0.50	0.50	0.50	0.50	0.49
headsmoke	=1 if head smokes	-	-	0.18	0.18	0.19	0.18	0.18
headmale	=1 if head is male	0.77	0.96	0.73	0.73	0.73	0.72	0.72
single	=1 if head is single	0.12	0.03	0.25	0.24	0.25	0.26	0.26
kids	Number of children (below 18 years) in the household	1.48	2.98	0.64	0.68	0.64	0.63	0.61
men	Number of male adults in the household	1.01	1.56	0.72	0.72	0.72	0.72	0.74
women	Number of female adults in the household	1.29	1.63	0.80	0.79	0.80	0.79	0.80
oldmen	Number of males with 65 years or above in the household	0.15	0.26	0.18	0.18	0.18	0.18	0.17
oldwomen	Number of females with 65 years or above in the household	0.19	0.20	0.41	0.41	0.40	0.41	0.41
age**	Average age in the household	40.20	38.20	47.15	47.19	47.25	47.27	46.92
age2**	Square of average age in the household	1,780.13	1,545.72	2,483.09	2,483.72	2,491.95	2,493.73	2,463.71
education**	Average schooling years in the household	6.75	2.50	8.91	8.77	8.89	8.95	9.00
education2**	Square of average schooling years in the household	61.69	8.80	82.66	80.70	82.47	83.22	83.98
headinsured	=1 if head has health insurance	0.27	-	0.74	0.74	0.76	0.74	0.73
urban	=1 if household is located on urban area	0.79	-	-	-	-	-	-
NE	=1 if household is located in the NE region	0.50	-	-	-	-	-	-
caste	=1 if household is of middle or backward castes	-	0.80	-	-	-	-	-
N		4,938	2,249	16,715.00	3,775.00	4,169.00	4,352.00	4,419.00

* Average among households with health expenditures>0

**Among those with 18 years or above

Data description

- **Health expenditures** account for approximately 5% of total household expenditures;
- The proportion of households with **nonzero health expenditures** varies between 51% and 70% in Brazil and Russia. However, it is much higher for India (100%);
- **Chronic diseases:** Brazil (24%), India (4%), Russia (9%)
- **Bad health:** Brazil (6%), Russia (varies between 18%-23%)
- Remaining variables are classified as: **demographic variables, risk factors and access indicators**

Results – Health expenditures

First part

- Strong positive effect of *headchronic*
- Negative effect of *headsingl* \Rightarrow possible access limitation

Second part

- Results comparable to first part
- Lower expenditures for NE households in Brazil

Table A.2: Logistic regression for health expenditures

Variable	Brazil	India	Russia Panel	Round 9	Round 10	Round 11	Round 12
headchronic	2.6***	1.30	1.10	1.6***	1.7***	1.6***	1.2**
headnonchronic	2.7***	11**	2.8***	3.1***	2.8***	3.1***	3.6***
headbad	1.10	-	1.10	0.93	1.3*	1.10	1.2*
income	1.00	1.00	1**	1*	1***	1***	1***
headwork	0.87	1.20	1.10	1.3***	1.5***	1.5***	1.4***
headphysical	1.10	-	-	-	-	-	-
headoverweight	0.98	-	1.10	0.98	0.98	1.10	0.87
headsmoke	-	-	1.10	0.89	0.91	0.98	0.91
headmale	1.3**	1.30	.59***	0.77	.62***	.67**	.67**
single	.65***	.13**	.52***	.41***	.43***	.45***	.45***
kids	1.1***	1.00	1.3***	1.10	0.99	1.10	1.10
men	1.10	1.20	1.4***	0.95	0.89	0.92	1.00
women	1.2***	1.50	1.2*	1.2**	1.10	1.10	0.98
oldmen	0.99	2.10	1.10	1.20	0.91	1.00	1.00
oldwomen	1.20	0.79	1.30	1.20	1.2*	1.6***	1.10
age	1.00	1.10	.95**	.95***	.96***	0.99	0.98
age2	1.00	1.00	1***	1***	1***	1.00	1**
education	1.2***	0.86	1.3*	1.2**	1.00	1.00	1.3**
education2	.99***	1.00	.98*	0.99	1.00	1.00	0.99
headinsured	1.20	-	1.00	.59***	.52***	.55***	.55***
urban	1.3***	-	-	-	-	-	-
NE	1.10	-	-	-	-	-	-
caste	-	1.20	-	-	-	-	-
_cons	.13***	0.86	-	1.10	3.9***	1.90	0.69
N	4,938	2,239	8,795	3,773	4,161	4,346	4,413
Pseudo R ²	8.6%	11.0%	5.5%	7.6%	8.0%	8.1%	8.5%

legend: * p<.1; ** p<.05; *** p<.01

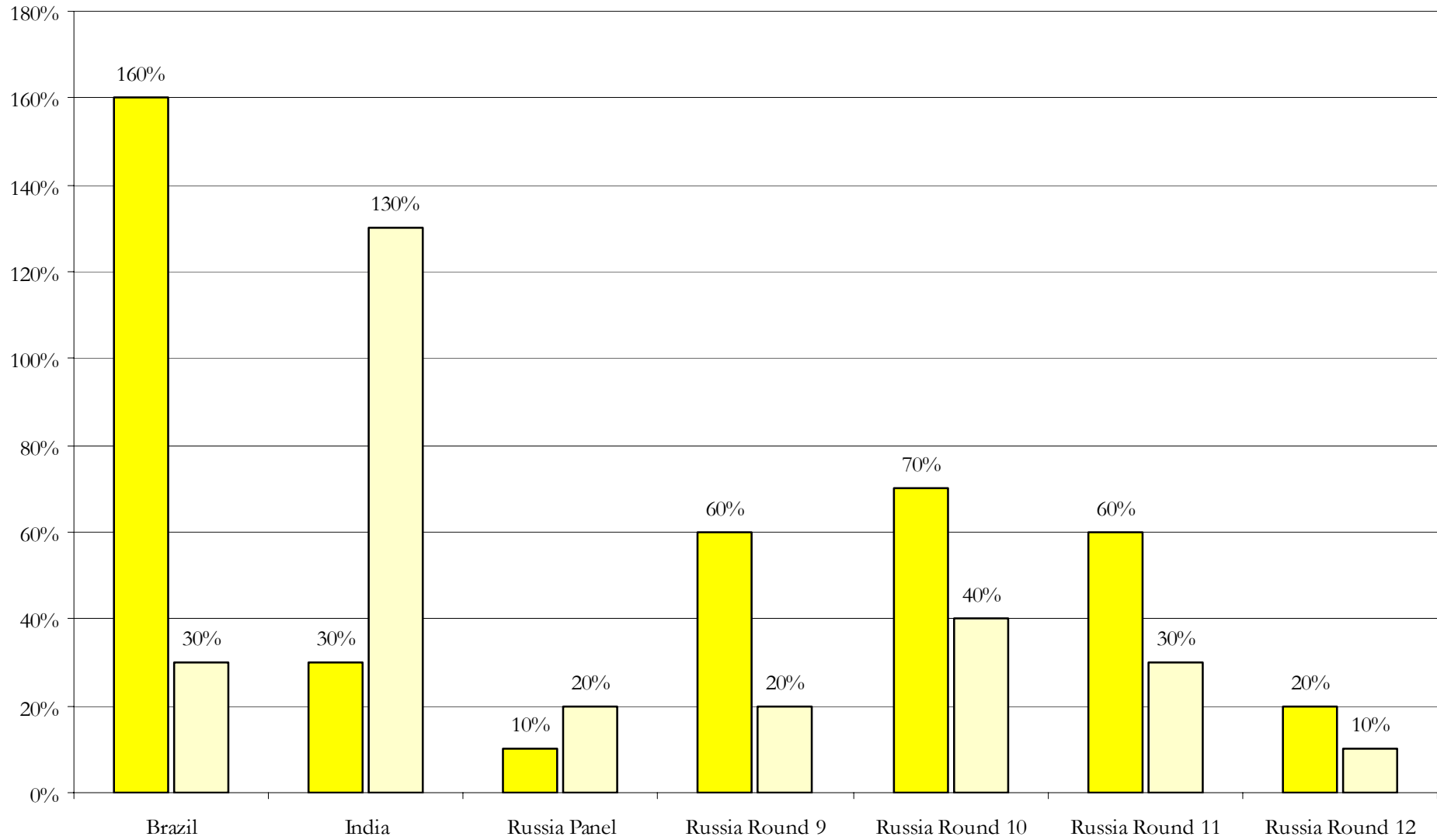
Table A.3: Results for OLS for $\ln(y)$ and GLM (log link and gamma distribution) for health expenditures

Variable	Brazil		India		Russia Panel		Round 9		Round 10		Round 11		Round 12	
	OLS	GLM	OLS	GLM	OLS	GLM	OLS	GLM	OLS	GLM	OLS	GLM	OLS	GLM
headchronic	1.4***	1.3***	4.1***	2.3***	1.10	1.2***	1.2**	1.20	1.3***	1.4***	1.3***	1.3**	1.3***	1.10
headnonchronic	1.2***	1.4***	2.8***	1.9***	1.4***	1.3***	1.4***	1.4***	1.2***	1.10	1.3***	1.10	1.3***	1.4***
headbad	1.10	1.20	-	-	1.3***	1.2***	1.5***	1.4***	1.3***	1.4***	1.2**	1.2*	1.3***	1.10
income	1**	1*	1***	1.00	1***	1***	1***	1***	1***	1***	1***	1***	1***	1***
headwork	0.98	0.98	1.40	1.10	1.10	1.00	1.10	1.00	1.10	1.10	1.3***	1.00	1.2**	0.97
headphysical	1.10	0.94	-	-	-	-	-	-	-	-	-	-	-	-
headoverweight	1.1**	1.2**	-	-	1.00	1.00	1.10	1.00	1.1*	1.00	0.97	1.00	1.10	0.96
headsmoke	-	-	-	-	0.89	1.10	1.00	1.00	1.10	1.2*	0.98	1.00	1.00	1.10
headmale	1.10	1.10	1.10	1.10	1.20	1.3***	1.10	1.10	1.4***	1.8***	0.92	0.93	1.3**	1.4*
single	0.93	.81*	.43***	.45***	.82*	0.98	.77**	0.81	1.00	1.4**	.76***	0.78	.81**	0.98
kids	0.99	.95*	1**	1.00	1.1***	1.00	1.1***	1.2***	1.10	0.94	1.00	0.96	1.00	0.99
men	1.1***	1.1*	1.10	0.99	1.00	1.00	1.10	1.2**	1.00	0.96	1.00	0.99	0.97	0.94
women	1.1***	1.2***	1.2***	1.2***	1.2***	1.1***	1.2***	1.2*	1.2**	1.4***	1.1*	1.00	1.2***	1.10
oldmen	1.10	0.88	1.10	1.10	1.00	1.2*	1.3**	1.3**	1.3**	1.20	1.4***	1.3*	1.20	1.00
oldwomen	1.10	0.99	1.00	1.20	1.3***	1.2***	1.2*	1.3*	1.2**	1.4***	1.10	1.10	1.3***	1.10
age	1***	1***	1.00	1.00	1.00	1**	1.00	1.00	1.00	1*	0.99	1.00	1.00	1.00
age2	1*	1.00	1.00	1.00	1.00	1**	1.00	1.00	1.00	1**	1.00	1.00	1.00	1.00
education	1.1***	1.1***	1.10	1.4***	0.95	1.00	0.90	0.88	1.00	0.97	1.10	1.10	1.10	1.20
education2	1.00	1.00	0.99	0.98	1.00	1.00	1*	1*	1.00	1.00	1.00	1.00	1.00	1.00
headinsured	1.3***	1.3**	-	-	0.97	.86**	0.89	0.84	.78***	.7***	.83**	0.84	.69***	0.96
urban	0.94	.78**	-	-	-	-	-	-	-	-	-	-	-	-
NE	.64***	.65***	-	-	-	-	-	-	-	-	-	-	-	-
caste	-	-	0.96	1.10	-	-	-	-	-	-	-	-	-	-
_cons	3.4***	5.2***	8.6***	22***	84***	82***	59***	161***	39***	55***	71***	119***	47***	57***
N	2,756	2,756	2,199	2,199	11,276	11,276	2,407	2,407	2,810	2,810	3,035	3,035	3,024	3,024
R ^{2†}	22.0%	5.1%	18.0%	8.6%	2.7%	-	10.0%	4.8%	8.6%	4.1%	7.6%	2.6%	7.4%	2.4%
aic	-	150,000,000	-	220,000,000	-	-	-	34,396	-	40,679	-	44,326	-	44,868
deviance	-	18,000,000	-	34,000,000	-	-	20,408	-	4,188	-	4,978	-	5,505	5,343

†Pseudo R² for GLM, computed as the square of the correlation between observed and predicted values for the dependent variable.

legend: * p<.1; ** p<.05; *** p<.01

Chart 1: Marginal effect of chronic diseases on household health expenditures



■ First part

□ Second part (GLM)

Results – Non health expenditures

Report only the continuous variation

- Single headed households and backward caste have **DECREASE** non health expenditures
- Male headed households, human capital (education) and health human capital (physical activities and overweight) **INCREASE** non health expenditures
- Limited effect of health indicators

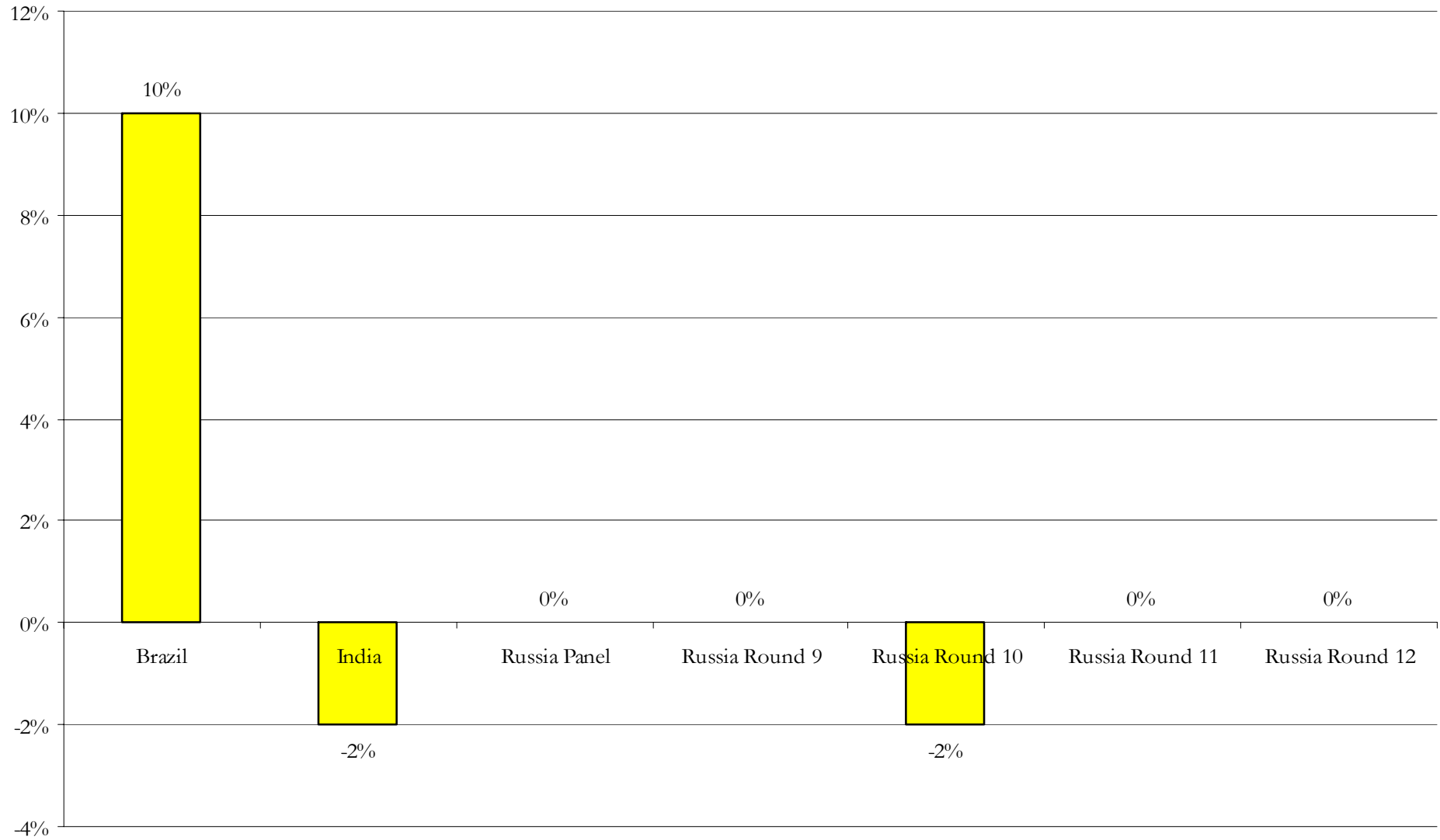
Table A.4: Results for OLS for ln(y) and GLM (log link and gamma distribution) for non health expenditures

Variable	Brazil		India		Russia Panel		Round 9		Round 10		Round 11		Round 12	
	OLS	GLM	OLS	GLM	OLS	GLM	OLS	GLM	OLS	GLM	OLS	GLM	OLS	GLM
headchronic	1.00	1.1*	0.98	0.98	0.97	1.00	0.97	1.00	1.00	0.98	1	1	1.1*	1
headnonchronic	1.00	1.00	0.98	0.98	1.00	1.00	0.98	1.00	1.00	0.99	.93**	0.96	1	1
headbad	0.97	0.92	-	-	.94***	.9***	.87***	.86***	.89***	0.91	.89***	.9**	.84***	.88**
income	1***	1***	1***	1***	1***	1***	1***	1***	1***	1***	1***	1***	1***	1***
headwork	1.1***	1.1**	0.98	0.98	1.1***	1.2***	1.3***	1.1*	1.3***	1.2***	1.3***	1.2***	1.4***	1.2***
headphysical	1.1***	1.1**	-	-	-	-	-	-	-	-	-	-	-	-
headoverweight	1.1***	1.1***	-	-	1.1***	1.1***	1.2***	1.2***	1.1***	1.1*	1.1***	1.1*	1.1*	1
headsmoke	-	-	-	-	1.1**	1.1**	1.1*	1.10	1.00	1.10	1	1	1.1**	1
headmale	1.1**	1.1**	1.2***	1.2*	1.10	1.1*	1.1*	1.2**	1.00	1.10	1.1*	1.1	0.93	0.91
single	.83***	0.92	.65***	.64***	.83***	.8***	.81***	0.89	.72***	.82**	.71***	.78***	.69***	.73***
kids	1***	1***	1.1***	1.1***	1.2***	1.1***	1.1***	1.2***	1.2***	1.2***	1.2***	1.1***	1.1***	1.1***
men	1.2***	1.1***	1.1***	1.1***	1.1***	1.00	1.1*	1.00	1.00	0.97	1	0.99	1.2***	1.1***
women	1.2***	1.1***	1.2***	1.2***	1.1***	1.00	1.1***	1.1**	1.00	1.00	1.1*	1	1.1***	0.98
oldmen	1.1*	1.00	1.1***	1.1***	1.2***	1.2***	1.3***	1.1*	1.2***	1.2***	1.1***	1.1	1.3***	1.2***
oldwomen	1.00	0.98	.91***	.9***	1.1***	1.1**	1.1***	1.1*	1.1***	1.2**	1.1***	1.1	1.1**	0.93
age	1***	1***	1***	1***	1***	1.00	0.99	1.00	.99*	0.99	0.99	1	1	1
age2	1***	1***	1***	1***	1***	1***	1.00	1.00	1.00	1.00	1	1**	1	1
education	1.2***	1.2***	1.1***	1.1***	1.00	0.99	1.1*	1.00	1.00	0.97	1	1	1	0.99
education2	1***	1***	1.00	1.00	1.00	1**	1.00	1.00	1.00	1.00	1	1	1	1
headinsured	1.4***	1.4***	-	-	0.99	.92***	.91**	.9*	0.96	0.93	0.97	.91**	.9***	0.92
urban	1.2***	1.2***	-	-	-	-	-	-	-	-	-	-	-	-
NE	.89***	.87***	-	-	-	-	-	-	-	-	-	-	-	-
caste	-	-	0.95	.93*	-	-	-	-	-	-	-	-	-	-
_cons	23***	35***	286***	323***	1553***	3427***	1725***	2579***	2758***	3868***	2727***	3485***	3007***	4224***
N	4,929	4,929	2,239	2,239	16,693	16,693	3,773	3,773	4,161	4,161	4,346	4,346	4,413	4,413
R ^{2†}	57.0%	38.2%	52.0%	44.1%	9.3%	-	33.0%	15.6%	42.0%	20.6%	36.0%	24.8%	38.0%	34.9%
aic	-	370,000,000	-	310,000,000	-	-	-	72,694	-	81,163	-	85,052	-	87,291
deviance	-	12,000,000	-	3,605,212	-	-	9,584	-	2,315	-	2,289	-	2,263	-

[†]Pseudo R² for GLM, computed as the square of the correlation between observed and predicted values for the dependent variable.

legend: * p<.1; ** p<.05; *** p<.01

Chart 2: Marginal effect of chronic diseases on non health expenditures



Results – Earned income

Report only the continuous variation

Positive effect of:

- Human capital (education)
- Health human capital (physical activities and overweight)

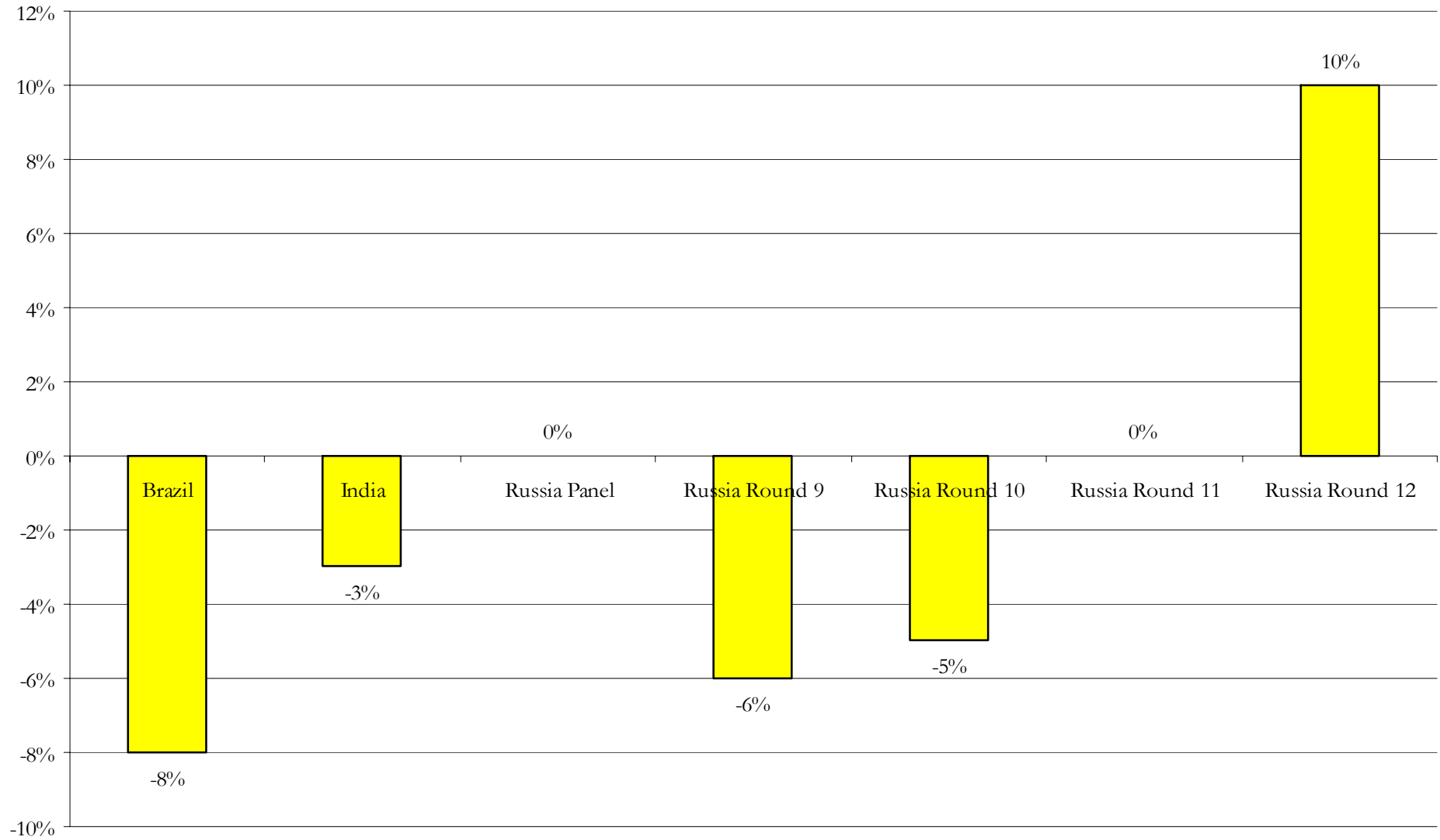
Table A.5: Results for OLS for ln(y) and GLM (log link and gamma distribution) for earned income

Variable	Brazil		India		Russia Panel		Round 9		Round 10		Round 11		Round 12	
	OLS	GLM	OLS	GLM	OLS	GLM	OLS	GLM	OLS	GLM	OLS	GLM	OLS	GLM
headchronic	0.93	.92*	1.00	0.97	1.10	1.00	0.97	0.94	0.96	0.95	1	1	1.1	1.1
headnonchronic	0.96	0.98	1.00	1.10	1.00	0.98	.91**	0.94	0.99	1	0.97	0.95	.88***	.92*
headbad	.72***	.73***	-	-	0.99	.94**	0.97	0.96	1	0.97	.85**	.85**	.89*	0.98
headwork	1.5***	1.4***	.64*	.69***	1.9***	1.6***	1.9***	1.4***	2.1***	1.6***	2.3***	1.6***	2.3***	1.6***
headphysical	0.99	1.1	-	-	-	-	-	-	-	-	-	-	-	-
headoverweight	1.2***	1.2***	-	-	1.1**	1	1.1**	1.1**	1	1	1	0.97	1	1
headsmoke	-	-	-	-	0.91	0.98	.9**	0.96	.9**	1	.88**	0.94	1	1
headmale	1.2***	1.2**	1.2*	1.3***	1.00	1.2***	1.3**	1.3***	1.3***	1.3***	1.3***	1.3***	1.1	1.3***
single	.78***	0.87	.76**	.7***	.7***	.79***	.79***	0.91	.69***	.72***	.71***	.77***	.63***	.77***
kids	1.00	1.00	1.1***	1***	1.1***	1.00	1.1**	1.1**	1	1	1	0.99	0.97	0.99
men	1.4***	1.4***	1.2***	1.2***	1.4***	1.3***	1.3***	1.2***	1.3***	1.2***	1.3***	1.3***	1.3***	1.3***
women	1.2***	1.2***	1.10	1.1*	1.2***	1.2***	1.3***	1.1**	1.3***	1.2***	1.3***	1.2***	1.3***	1.2***
oldmen	1.00	1.10	1.10	1.10	0.98	1.1***	1.2***	1.1*	1.2***	1.2***	1.2***	1.2***	1	1.1
oldwomen	0.93	0.90	1.00	1.00	1.00	1.1**	1.1*	1	1.2**	1.1**	1.2**	1.1	1.2***	1.2***
age	1***	1***	1.00	1*	1.1***	1.1***	1***	1.1***	1.1***	1.1***	1.1***	1.1***	1.1***	1.1***
age2	1***	1*	1**	1**	1***	1***	1***	1***	1***	1***	1***	1***	1***	1***
education	1.2***	1.2***	0.94	0.96	0.99	0.96	1.00	0.96	0.98	0.93	1.1	0.89	1	0.93
education2	1.00	1.00	1**	1**	1.00	1**	1.00	1	1	1*	1	1*	1	1*
headinsured	1.4***	1.5***	-	-	.92*	.87***	.84***	0.9	.78***	.85***	.75***	0.9	.74***	.85**
urban	1.6***	1.4***	-	-	-	-	-	-	-	-	-	-	-	-
NE	.61***	.67***	-	-	-	-	-	-	-	-	-	-	-	-
caste	-	-	1.1	1.1*	-	-	-	-	-	-	-	-	-	-
_cons	9.9***	16***	967***	882***	148***	588***	426***	709***	366***	759***	313***	771***	344***	836***
N	4,126	4,126	1,810	1,810	13,894	13,894	3,160	3,160	3,448	3,448	3,599	3,599	3,687	3,687
R ² _t	58.0%	17.6%	19.0%	15.6%	9.3%	-	36.0%	11.7%	37.0%	14.5%	40.0%	12.7%	43.0%	17.9%
aic	-	320,000,000	-	250,000,000	-	-	-	58,095	-	64,510	-	68,006	-	70,051
deviance	-	14,000,000	-	8,184,699	-	14,453	-	3,203	-	3,473	-	3,779	-	3,726

[†]Pseudo R² for GLM, computed as the square of the correlation between observed and predicted values for the dependent variable.

legend: * p<.1; ** p<.05; *** p<.01

Chart 3: Marginal effect of chronic diseases on earned income



Results – Unearned income

First part

- Gender of the head of household and demographic composition

Limited support for positive effect of chronic diseases

Table A.6: Logistic regression for unearned income

Variable	Brazil	India	Russia Panel	Round 9	Round 10	Round 11	Round 12
headchronic	1.7***	1.00	1.00	1.30	0.92	1.1	1
headnonchronic	0.97	1.4**	0.92	1.3**	1.20	1.1	1.3**
headbad	0.80	-	0.88	1.20	1.6**	1.2	1.2
headwork	.27***	0.98	.48***	.5***	.44***	.37***	.37***
headphysical	1.5***	-	-	-	-	-	-
headoverweight	.83*	-	1.10	0.90	0.95	1	0.85
headsmoke	-	-	0.87	0.91	1.10	0.97	0.94
headmale	.35***	.22***	.56*	.59*	.56**	.62*	.57**
single	1.00	0.65	0.70	0.96	0.82	0.9	1.1
kids	0.98	1.00	1.8***	1.2***	1.7***	2.1***	2.4***
men	1.10	1.10	1.5**	1.10	1.10	1.1	1.2*
women	1.00	1.20	1.30	1.3**	1.10	1.1	1.2
oldmen	4.6***	1.20	6.3***	14***	8.6***	13***	17***
oldwomen	4.5***	0.89	18***	21***	15***	15***	19***
age	0.97	.92**	.89**	0.97	.92**	.88***	.81***
age2	1.00	1**	1**	1.00	1**	1***	1***
education	1.1**	1.4**	1.20	0.87	1.5**	1.6*	2.2***
education2	1.00	.96*	0.99	1.00	0.98	0.98	.96**
headinsured	1.00	-	1.00	1.10	1.6***	1.6***	2.2***
urban	0.96	-	-	-	-	-	-
NE	1.00	-	-	-	-	-	-
caste	-	0.78	-	-	-	-	-
_cons	2.40	1.80	-	7.40	1.50	3.6	2.1
N	4,938	2,247	4,219	3,775	4,163	4,347	4,415
Pseudo R ²	27.0%	4.4%	8.7%	21.0%	21.0%	23.0%	25.0%

legend: * p<.1; ** p<.05; *** p<.01

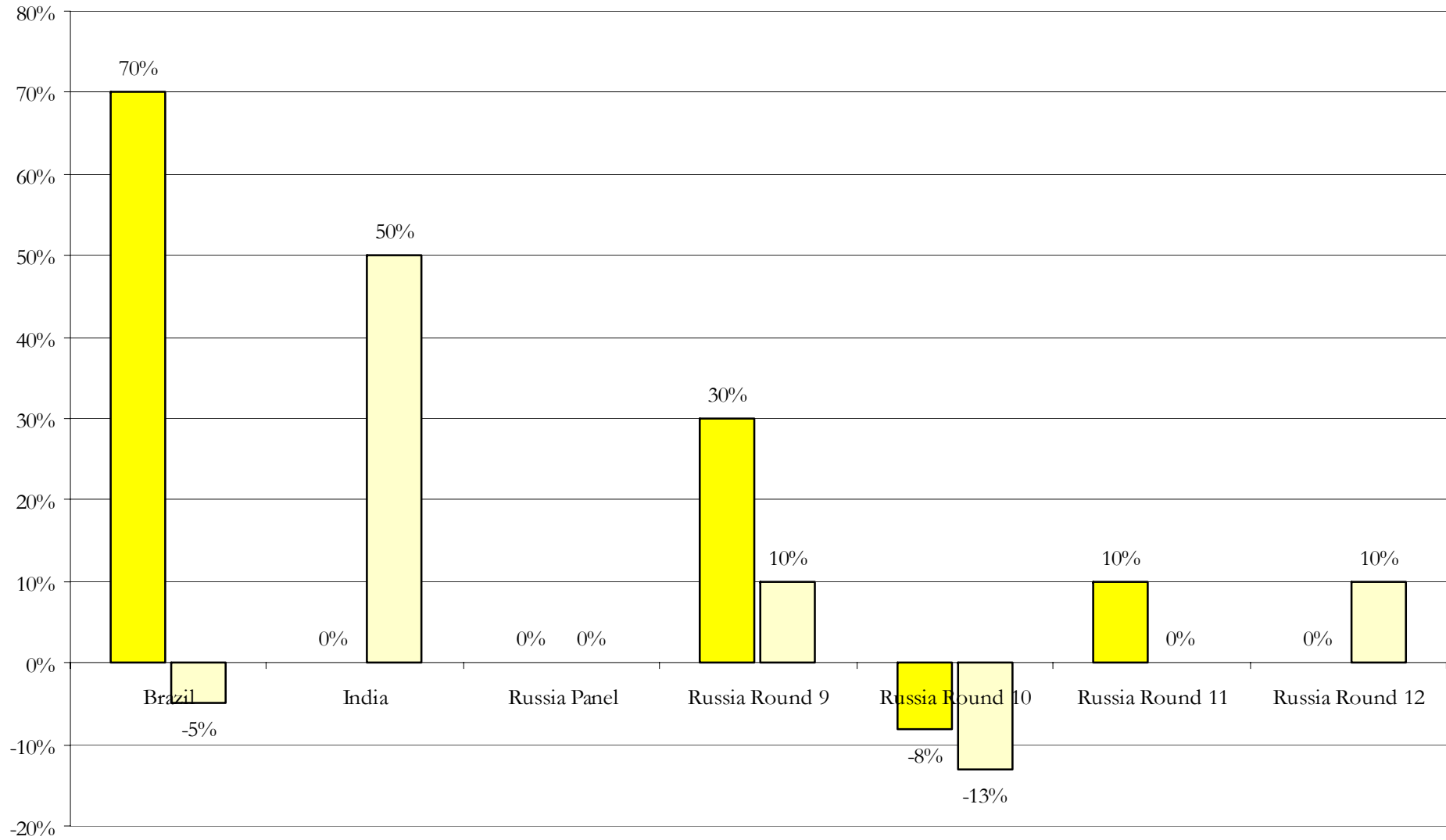
Table A.7: Results for OLS for ln(y) and GLM (log link and gamma distribution) for unearned income

Variable	Brazil		India		Russia Panel		Round 9		Round 10		Round 11		Round 12	
	OLS	GLM	OLS	GLM	OLS	GLM	OLS	GLM	OLS	GLM	OLS	GLM	OLS	GLM
headchronic	0.97	0.95	1.10	1.50	1.00	1.00	1.00	1.10	1.00	.87*	1.00	1	1	1.1
headnonchro	.86**	0.95	0.81	0.78	1.1**	1.00	1.00	1.00	1.10	1.00	1.2***	1	1.2***	1
headbad	0.92	.84*	-	-	0.95	0.88	1.00	1.00	.91*	0.96	.84***	.8*	0.91	0.83
headwork	.58***	.67***	2.5*	6***	.73***	0.92	.8***	1.20	.69***	.71***	.72***	.79**	.78***	1
headphysical	1.2**	1.3**	-	-	-	-	-	-	-	-	-	-	-	-
headoverweig	1.1**	1.2**	-	-	0.99	1.10	1.1***	1.3**	1.1**	1.00	1.00	1	1	1.2
headsmoke	-	-	-	-	1.00	1.00	1.2***	1.4***	1.10	1.00	1.00	0.98	0.96	0.99
headmale	.83**	0.99	0.99	0.93	1.1*	1.20	0.94	1.00	.85**	0.85	0.91	0.94	0.98	1.7**
single	0.87	0.87	2.30	2.8**	1.10	0.93	0.96	0.86	0.91	.75**	1.00	0.86	1.1	1.1
kids	0.99	1.00	1.00	0.95	1.1**	1.00	1*	1.10	0.97	0.99	.95**	0.99	.94**	1.1
men	1.2***	1.2***	1.10	1.10	1.10	1.10	1.2***	1.2*	1.1***	1.1*	1.2***	1.2	1.1**	0.88
women	1.2***	1.2**	1.7***	1.6***	1.2***	1.10	1.1**	0.89	1.1***	1.10	1.1***	1.2*	1.2***	1.1
oldmen	1.4***	1.20	1.5**	2***	1.7***	1.4***	1.9***	1.4**	2***	1.6***	2.1***	1.6***	2***	1.3
oldwomen	1.00	0.89	0.73	0.85	1.7***	1.20	1.7***	1.3**	1.6***	1.10	1.8***	1.2	1.7***	1.1
age	1***	1***	1.00	1.1**	0.99	0.99	.98**	0.98	1.00	1.00	1.00	0.97	1	0.99
age2	1.00	1.00	1.00	1**	1.00	1.00	1**	1.00	1.00	1.00	1.00	1	1	1
education	1.1***	1.2***	1.00	1.5**	1.2***	0.97	0.97	0.95	1.00	0.99	0.92	0.93	1	0.99
education2	1.00	1.00	1.00	0.97	.99*	1.00	1*	1.00	1.00	1.00	1***	1	1	1
headinsured	1.3***	1.3**	-	-	1.1*	1.20	1.00	0.94	1.1**	1.3***	1.2***	1.2	1.1**	1.3
urban	1.1*	1.00	-	-	-	-	-	-	-	-	-	-	-	-
NE	.85***	.82**	-	-	-	-	-	-	-	-	-	-	-	-
caste	-	-	.61**	0.83	-	-	-	-	-	-	-	-	-	-
_cons	20***	23***	7.1**	1.20	366***	2351***	953***	2296***	759***	2133***	811***	3416***	658***	2227***
N	2,673	2,673	481	481	14,205	14,205	3,137	3,137	3,557	3,557	3,719	3,719	3,792	3,792
R ^{2†}	35.0%	12.1%	28.0%	13.7%	3.4%	-	13.0%	1.3%	15.0%	2.6%	17.0%	1.2%	15.0%	0.4%
aic	-	200,000,000	-	55,000,000	-	-	-	55,632	-	63,645	-	67,787	-	70,641
deviance	-	17,000,000	-	7,525,104	-	18,916	-	3,802	-	3,910	-	4,703	-	5,708

†Pseudo R² for GLM, computed as the square of the correlation between observed and predicted values for the dependent variable

legend: * p<.1; ** p<.05; *** p<.01

Chart 4: Marginal effect of chronic diseases on unearned income



■ First part

■ Second part (GLM)

Results – Productivity losses

Clear indication of positive effect of chronic diseases, although not always significant

Table A.8: Logistic regression for loss of work days

Variable	Brazil	Russia Panel	Round 9	Round 10	Round 11	Round 12
headchronic	2.2***	1.10	1.50	2.2***	1.3	1.4*
headbad	2.2***	2.1***	1.7*	3***	3.5***	2.8***
income	1.00	1.00	1*	1	1	1
headwork	0.79	4.3***	8.3***	19***	20***	7.9***
headphysical	1.20	-	-	-	-	-
headoverweight	0.92	1.40	0.98	1.1	0.94	1.2
headsmoke	-	0.89	1.20	1.4*	1.4*	1.5**
headmale	.62**	1.10	1.80	1.1	0.67	1.4
single	1.10	1.10	2.00	1.9*	0.86	1.1
kids	0.99	0.93	0.95	1.1	0.87	.79**
men	1.10	1.00	1.00	1.2	1.1	0.7
women	1.00	0.92	1.10	1	0.8	0.93
oldmen	1.10	.35*	0.70	0.78	1.2	.29**
oldwomen	0.77	0.83	0.79	0.69	0.88	0.7
age	1.00	1.10	1.00	0.95	0.97	1
age2	1.00	1.00	1.00	1	1	1
education	0.97	2.70	2.40	1.3	3.6	1.5
education2	1.00	0.94	0.96	0.99	0.93	0.98
headinsured	1.20	1.40	2.2*	1.9	1.1	2.2*
urban	.67**	-	-	-	-	-
NE	1.4**	-	-	-	-	-
caste	-	-	-	-	-	-
_cons	.14***	-	.00002***	.00066***	.000047**	.00045**
N	4,938	1,747	3,775	4,163	4,347	4,415
Pseudo R ²	6.4%	7.2%	15.0%	20.0%	19.0%	17.0%

legend: * p<.1; ** p<.05; *** p<.01

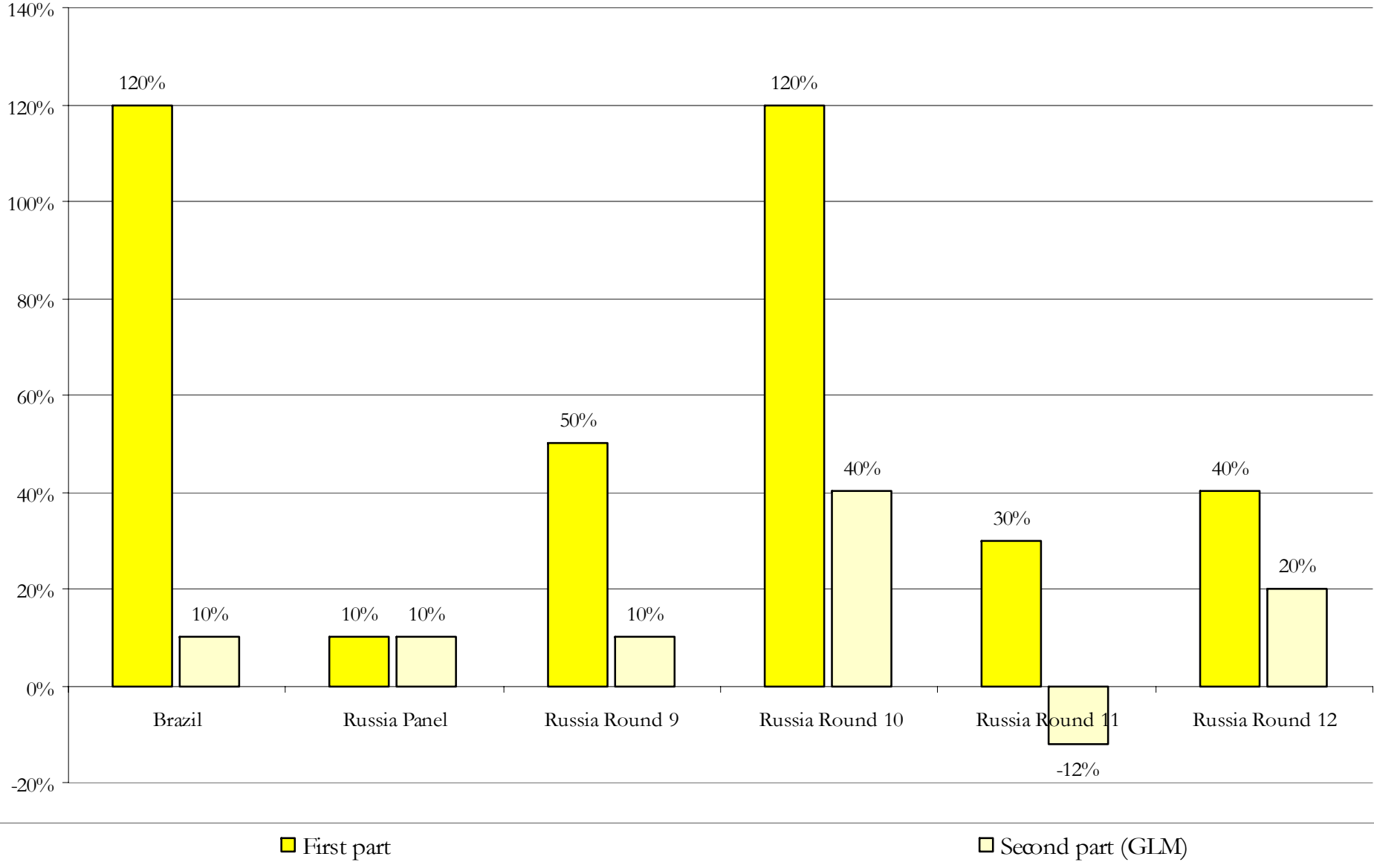
Table A.9: Results for OLS for ln(y) and GLM (log link and gamma distribution) for loss of work days

Variable	Brazil		Russia Panel		Round 9		Round 10		Round 11		Round 12	
	OLS	GLM	OLS	GLM	OLS	GLM	OLS	GLM	OLS	GLM	OLS	GLM
headchronic	1.10	1.10	2.1**	1.10	0.95	1.10	1.3*	1.4**	0.97	0.88	1.2	1.2
headbad	0.99	1.00	0.81	1.4***	1.10	1.30	1.10	1.20	1.30	1.5**	1.7***	1.7***
income	1.00	1.00	1.00	1***	1.00	1.00	1*	1**	1.00	1	1**	1
headwork	.42***	.46***	0.65	1.00	1.10	1.00	0.87	0.88	1.10	1.3	0.95	1.1
headphysical	1.10	1.00	-	-	-	-	-	-	-	-	-	-
headoverweight	0.89	0.82	0.74	0.94	0.88	0.87	1.00	1.00	1.00	0.92	0.98	0.92
headsmoke	-	-	0.39	1.10	1.20	1.20	1.10	1.10	1.10	1.1	1	0.98
headmale	1.10	1.30	0.88	1.10	1.00	0.99	1.70	1.40	1.20	1.1	1.4	1.2
single	1.30	1.40	2.50	0.99	0.88	1.00	1.50	1.40	0.67	0.7	1	0.93
kids	0.93	0.95	0.80	0.98	.86*	.85**	1.10	1.10	0.91	0.92	0.96	0.96
men	1.2*	1.10	1.50	1.10	0.91	0.92	1.10	1.20	1.00	1.1	0.93	0.95
women	0.97	0.99	1.40	1.10	1.10	1.00	1.10	1.00	1.3*	1.3	1.2	1.1
oldmen	0.94	1.00	3.20	0.99	0.90	0.96	0.85	0.81	0.85	0.78	0.7	0.6
oldwomen	1.10	1.40	1.20	1.20	1.00	1.30	0.75	0.72	1.10	1.1	1.8**	1.7*
age	1.1**	1.1*	1.10	1*	1.10	1.10	1.10	1.1**	0.96	0.95	1.1	1.1
age2	1**	1**	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1	1	1
education	0.97	1.00	3.80	1.30	1.90	1.50	0.76	1.10	0.27	0.31	2.5	2.3
education2	1.00	1.00	0.92	0.99	0.96	0.97	1.00	0.99	1.10	1.1	0.96	0.96
headinsured	1.00	1.10	1.00	1.20	0.89	0.86	1.10	1.10	1.30	1.7**	1.3	1.6
urban	0.93	0.93	-	-	-	-	-	-	-	-	-	-
NE	0.97	1.00	-	-	-	-	-	-	-	-	-	-
caste	-	-	-	-	-	-	-	-	-	-	-	-
_cons	2.60	4.6**	0.01	0.86	0.23	1.10	2.10	0.40	4,781.00	2768*	0	0
N	413	413	650	650	134	134	177	177	172	172	167	167
R ^{2†}	19.0%	11.1%	16.0%	-	11.0%	14.8%	15.0%	17.7%	15.0%	17.5%	19.0%	18.7%
aic	-	12,000,000	-	-	-	909	-	1,185	-	1,164	-	1,119
deviance	-	1,786,167	-	452	-	79	-	105	-	107	-	121

†Pseudo R² for GLM, computed as the square of the correlation between observed and predicted values for the dependent variable.

legend: * p<.1; ** p<.05; *** p<.01

Chart 5: Marginal effect of chronic diseases on productivity losses



Conclusion

- Chronic diseases are significantly associated with increased health expenditures
- Less apparent, but still present, effect of reduced labour earnings and increased productivity losses
- Apparently the households manage to insure the consumption of non health related items \Rightarrow probably through private health insurance, since remittances (both public and private) are not affected

Conclusion

- Increased prevalence of chronic diseases in developing countries
- Long term effects
- Mortality affects mainly the economically active population