



NATIONAL RESEARCH UNIVERSITY  
HIGHER SCHOOL OF ECONOMICS

*Irina Andrievskaya, Maria Semenova*

**DOES BIOLOGICAL ENDOWMENT  
MATTER FOR DEMAND FOR  
FINANCIAL SERVICES?  
EVIDENCE FROM RUSSIAN  
HOUSEHOLD SURVEY**

BASIC RESEARCH PROGRAM

WORKING PAPERS

SERIES: FINANCIAL ECONOMICS  
WP BRP 52/FE/2016

**DOES BIOLOGICAL ENDOWMENT MATTER FOR DEMAND  
FOR FINANCIAL SERVICES?  
EVIDENCE FROM RUSSIAN HOUSEHOLD SURVEY<sup>3,4</sup>**

There are many studies revealing factors which influence the demand for financial services. However genetic features, determining the individual's overall postnatal behaviour, have not been studied within this context. This paper extends the previous literature by studying to what extent individual biological endowment, proxied by prenatal testosterone (PT) (measured by the 2D:4D ratio), can determine personal demand for bank services and insurance. We use data from the Russian Longitudinal Monitoring Survey of 2011–2012. Our findings confirm the existence of the link between inherent biological variation and financial inclusion: PT affects the use of bank cards, intention to take out a loan, having a bank deposit and the consumption of insurance products.

JEL Classification: D14, D81, G21, G22, O16, P34.

Keywords: prenatal testosterone, 2D:4D ratio, financial inclusion, household, RLMS, Russia.

---

<sup>1</sup>[irina.k.andrievskaia@gmail.com](mailto:irina.k.andrievskaia@gmail.com), PhD

<sup>2</sup>Corresponding author: [msemenova@hse.ru](mailto:msemenova@hse.ru), Senior Research Fellow, Associate Professor, Center for Institutional Studies and Department of Finance, National Research University Higher School of Economics, Moscow, Russia

<sup>3</sup> We are grateful to John Nye, Maria Yudkevich, Ekterina Kochergina, Ilya Prakhov, Alex Teytelboym, Koen Schoors for their help and useful advice.

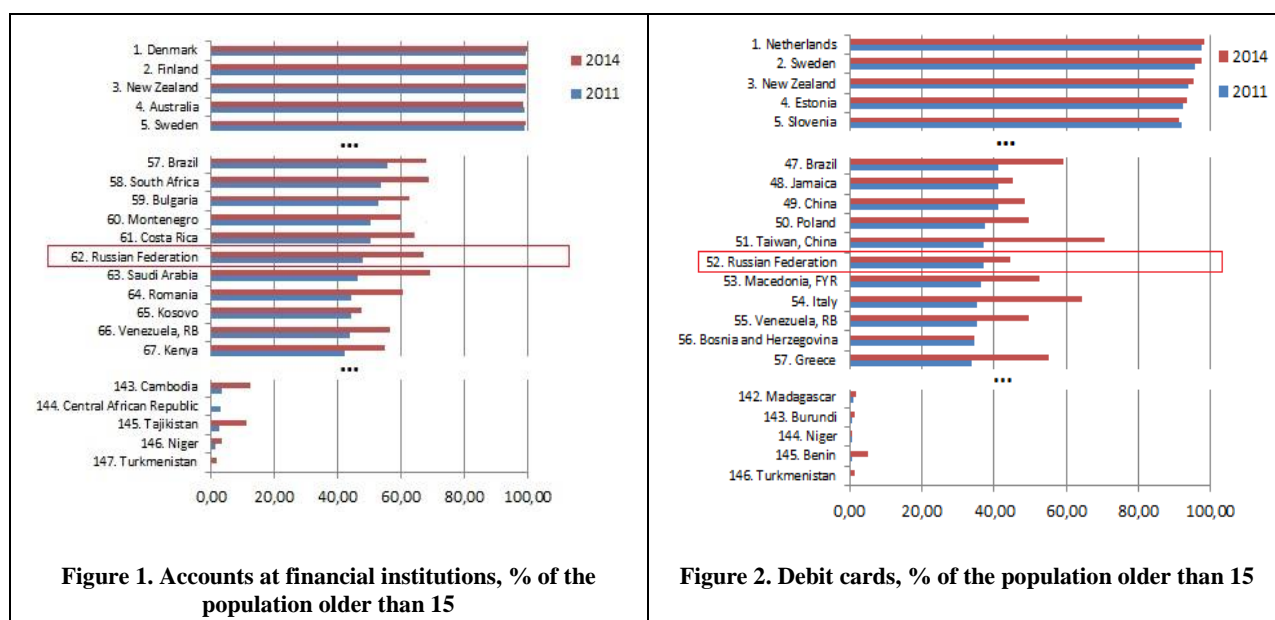
<sup>4</sup> The paper was prepared within the framework of the Basic Research Program at the National Research University Higher School of Economics (HSE) and supported within the framework of a subsidy granted to the HSE by the Government of the Russian Federation for the implementation of the Global Competitiveness Program

The financial support from the Government of the Russian Federation within the framework of the implementation of the 5-100 Program Roadmap of the National Research University Higher School of Economics is acknowledged.

## 1. Introduction

The development of the financial system is important for economic growth (Beck et al., 2000), (Rajan, Zingales, 1998), can improve the welfare of people (Claessens, 2006) and can lead to lower income inequality (Clarke et al., 2003), (Beck et al., 2007), (Honohan, 2004). One of the important characteristics of this development is the extent to which financial services are available to and used by different groups of individuals. This is usually called *financial inclusion*. According to G20,<sup>5</sup> financial inclusion has “three dimensions: (i) access to financial services; (ii) usage of financial services; and (iii) the quality of the products and the service delivery” (p.1). While access reflects the availability of financial services (of reasonable quality, at reasonable prices), the usage means the actual consumption of these services (Claessens, 2006).

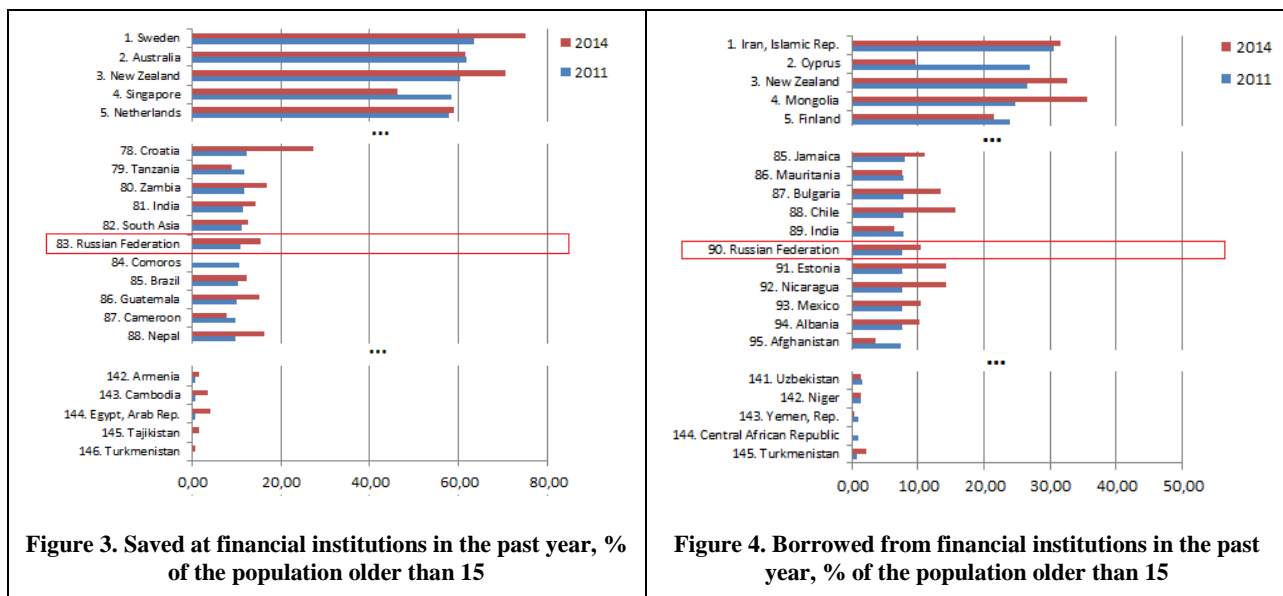
Many developing and transition economies suffer from a low level of financial inclusion and, in particular, low financial service usage. One example is Russia, whose rank with respect to financial inclusion is low. According to the World Bank Financial Inclusion Index, in 2014 Russia ranked 62nd out of 147 among countries for the use of bank accounts with less than 70% of the population having accounts at the financial institutions (see Figure 1). This is, however, much higher compared to less than 50% in 2011. The rank is slightly higher when we consider debit card use by half of the Russian households (see Figure 2), but in general Russia still remains below all major developed countries.



Source: WB Global Financial Inclusion Index ([http://data.worldbank.org/data-catalog/financial\\_inclusion](http://data.worldbank.org/data-catalog/financial_inclusion))

If we consider savings and loans, Russia is even lower: 83<sup>rd</sup> and 90<sup>th</sup> place respectively in 2014 (see Figure 3 and Figure 4).

<sup>5</sup> <http://www.gpfi.org/sites/default/files/G20%20Set%20of%20Financial%20Inclusion%20Indicators.pdf>



Source: WB Global Financial Inclusion Index ([http://data.worldbank.org/data-catalog/financial\\_inclusion](http://data.worldbank.org/data-catalog/financial_inclusion))

According to the results of the National Agency for Financial Studies (NACFIN) 2014 survey<sup>6</sup> approximately 23% of the Russian people do not use financial services at all, while for the low-income segment this number is 53%. Although these figures are lower than the average global data, according to which 50% of people of working age around the world do not use formal financial services and for the low-income segment this figure approaches 77% (CGAP<sup>7</sup>, 2014), the financial inclusion of Russian households is still low.

There are many papers dealing with a wide range of factors determining the demand for and the use of financial services. In this paper we focus on the one of them, which is rarely analysed in this respect: individual inherent biological variation. This can play a significant role when a person chooses what financial services to consume and, at the same time cannot be influenced by postnatal external factors.

To focus on the non-changeable diversity, we consider the level of prenatal testosterone (PT), which is a biological characteristic of an individual not affected postnatally. PT plays a crucial role in neural and behavioural sexual differentiation as well as external genital differences (Hines, 2006). Higher levels of PT correspond to more male-typical postnatal behaviour. PT influences also the postnatal behaviour. Quite a few studies confirm that the level of PT is negatively correlated with the individual's risk aversion (see, among others, (Apicella et

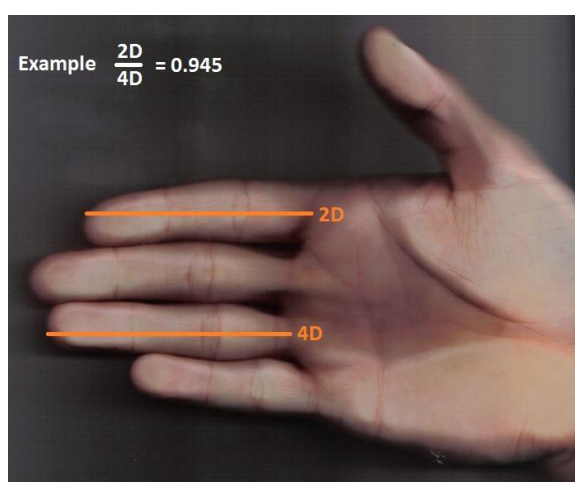
<sup>6</sup> In 2014 the National Agency for Financial Studies (NACFIN) carried out the survey of the Russian consumers in order to evaluate the level of financial inclusion in the Russian Federation. The survey covered all three aspects of financial inclusion, namely: access to financial services, usage of financial services and the quality of financial products. The survey covers 2800 respondents from all over the country older than 18 years. The results demonstrate the point of view of consumers. The full report is available on the website of the NACFIN <http://www.cgap.org/sites/default/files/Working-Paper-Financial-Inclusion-in-Russia-Aug-2014.pdf>

<sup>7</sup> The Consultative Group to Assist the Poor, housed at the World Bank. It includes 34 organizations. <http://www.cgap.org/>

al., 2008), (Stenstrom et al., 2011), (Branas-Garza, Rustichini, 2011), (Sapienza et al., 2009)) and with overconfidence (Dalton, Ghosal, 2014), while it is positively associated with aggression (Kilduff et al., 2013), cognitive skills (Bosch-Domenech et al., 2014) and agreeableness (Fink et al., 2004). All these, in turn, can affect individual behaviour with respect to financial decision making (in particular, via risk-aversion).

As a measure of PT we use the ratio of the second finger length over the fourth finger length, the so called 2D:4D ratio (see Figure 5). This ratio is negatively correlated with PT (Malas et al., 2006), (Manning, 2003).

**Figure 5. 2D:4D ratio, definition**



Source: [https://en.wikipedia.org/wiki/Digit\\_ratio](https://en.wikipedia.org/wiki/Digit_ratio)

We use data from the Russian Longitudinal Monitoring Survey (RLMS-HSE) carried out during the period October 2011 to February 2012. Our findings demonstrate that biological endowment is an important determinant of the behaviour of people with respect to their use of some types of financial services. In particular, it plays a role for individual intention to apply for a bank loan, to use bankcards for non-cash transactions and consume insurance products.

Our contribution is two-fold. First, we employ a specific measure of individual inherent biological variation within financial system framework. And secondly, we examine whether this biological characteristic can affect her behaviour with respect to the consumption of financial services in an economy with low levels of financial inclusion. We focus on both bank and insurance products.

The paper is organized as follows. In section 2 we briefly discuss the related literature. Section 3 presents our data and describes the methodology that we employ. Major findings and robustness check are examined in section 4. Section 5 concludes.

## **2. Literature and empirics on financial inclusion**

### ***2.1.1 Determinants of financial services consumption***

There are many studies devoted to the factors influencing the demand for financial services by households. These factors include socio-demographic and economic indicators such as income, place of residence, age, gender. According to Demirguc-Kunt, Klapper, (2012), in developing countries men more often use formal bank accounts than women. Education is also important for the differences in the use of financial services. In developing countries people with higher education are twice as likely to have a bank account as those with lower levels of education. Moreover, 25–64 year olds in developing countries more often have bank accounts compared to people from other age groups (Demirguc-Kunt, Klapper, 2012).

Some studies point to the importance of financial literacy (Duflo, Saez, 2003), (Bertrand, Morse, 2011). For example, in (Lusardi, Tufano, 2009) the authors find that low financial literacy results in higher-cost borrowing for individuals. Van Rooij et al. (2011) show the negative link between individual financial literacy and their investment in stock. Financial literacy also affects the planning behaviour of individuals increasing their wealth holdings (Lusardi, Mitchell, 2007). However, in (Cole et al., 2011) the authors find that financial literacy has an effect only when people are poorly educated.

The macroeconomic environment also matters. According to Beck et al. (2007), economic development, credit information sharing and the development of physical infrastructure have a positive effect, while government ownership is negatively associated with the use of and access to financial services. Religion, legal origin (Beck et al., 2007) and institutional environment (Claessens, 2006) also have some effect on the use of financial services.

Expectations about future income can also influence household financial strategies. For example, Semenova (2011) shows that the households in Russia, who enjoy improving financial conditions and are satisfied with them, are more likely to save and less likely to borrow.

There is some evidence that shows the importance of individual attitude towards risk in explaining the differences in consumption of financial services. The impact of risk attitude on demand for financial services is not unambiguous as there can be different motives behind the consumption of financial services. In particular, there can be promotion or prevention incentives (see Higgins, 1998) when the aim is to achieve financial gains or to avoid financial losses respectively (Zhou, Tuan Pham, 2004). Another example is (Cole et al., 2011) where the authors include attitude towards risk as a possible determinant of the demand for financial services. The findings confirm that in Indonesia more risk-averse people are more likely to have a formal loan

or open a bank account, while less risk-averse households have more commitment savings and deposits.

Individual financial decision-making can be affected by genetics as well. For example, according to (Wallace et al., 2007), 40% of the variation in responder behaviour in the ultimatum game<sup>8</sup> is due to genetic effects. People also differ genetically in the attitude towards financial risk with 25% variation in portfolio risk attributed to genetics (Cesarini et al., 2010). However, research with respect to the influence of individual biological characteristics within financial decision-making—and in particular within a financial inclusion context—is still limited and needs further investigation.

## *2.2 PT as a determinant of life outcomes<sup>9</sup>*

Biological characteristics formed prenatally influence to a large extent postnatal behaviour and the achievements of a person. There are quite a few studies that show the importance of PT for individual achievements in sport (Goldy, Meggs, 2011). PT is found to be positively correlated with physical fitness for males and females (Honekopp et al., 2006). This is also confirmed, among others, in (Mannin, Taylor, 2001), where the authors provide evidence that men with higher PT (lower 2D:4D ratios) are more competitive in football and in (Voracek et al., 2010), where the findings suggest that females with higher levels of PT have better fencing rankings. (Moffit, Swank, 2011) also provides evidences in favour of the link between PT and potential athleticism.

PT also appears to have an effect on individual cognitive skills. According to (Kempel et al., 2005) females with higher levels of PT perform better with respect to cognitive tests, while men perform better than women on spatial abilities. PT also enhances academic performance (Nye et al., 2012). This could be the reason why both males and females do better in Java programming (Brosnan et al., 2011) and why females with higher PT more often choose mathematical disciplines (Maureen, 2009).

Some studies point to the fact that PT affects occupation type (Dabbs, 1992), (Nye et al., 2014). People high in PT choose risky careers in finance more often (Sapienza et al., 2009). Traders with more PT work longer in the financial sector and demonstrate better long-term profitability (Coates et al., 2009).

---

<sup>8</sup> An economic experiment game with two participants: a proposer and a receiver. They have to divide a particular sum of money. The proposer offers how to divide the money and the receiver either accepts or rejects (in the latter case both players receive zero).

<sup>9</sup> A literature review with respect to the effect of PT on the postnatal life is presented in (Nye et al., 2014).

PT also affects the choice of working with people versus things. People high in PT have more interest in things rather than in people (Belts et al., 2011). Nye and Orel (2015) indicate that females having enterprising occupations have higher levels of PT compared to women in conventional and social areas. For men PT is also negatively associated with the probability of speaking a foreign language and the probability of getting a higher education degree (Nye et al., 2014).

### ***2.3 Financial inclusion in Russia***

Russia is a good example of an emerging economy with a low level of financial inclusion. The use of financial services depends much on their availability. If we consider bank services, according to the Central Bank of the Russian Federation, there are approximately 42 000 bank branches across Russia<sup>10</sup> as of May 2015. This corresponds to approximately 30 branches per 100 000 people. The distribution of bank branches across Russia is relatively uneven: 28% are located in the Central Federal District (out of which 16% are attributed to Moscow and the Moscow region). However, this corresponds to the uneven distribution of the Russian population. According to the results of the NACFIN survey carried out in 2014, only 77% of the Russian people are satisfied with the number and location of bank branches (72% for bank ATMs).

Consumers in Russia use more credit products compared to saving (39% versus 24% respectively). Only 57% of people use insurance products, the major part of which is mandatory insurance products (NACFIN survey). There are 537 insurance companies in Russia<sup>11</sup> as of July 2015.

According to the NACFIN survey, among the reasons for not using credit products in Russia are the price of credit for short-term products, and the absence of any plans to buy real estate or cars for long-term products. The absence of any need is also an important factor for not using insurance products. At the same time, level of income is not considered an important barrier to the use of financial services except for savings products. Better knowledge about financial products and their features does not always correlate with the use of them. For some groups of consumers (e.g. for low-income segment) this correlation can even be negative.

Two of the basic determinants of financial services use, according to existing literature—the age and gender—do not significantly influence the usage of financial services in Russia, while the most relevant determinant of the financial services consumption appears to be individual income. For example, low-income respondents much less actively use saving products

---

<sup>10</sup>The full list of credit organizations on the 29<sup>th</sup> of May 2015, <http://www.cbr.ru/credit/main.asp>

<sup>11</sup>The source is the website of the Central Bank of Russia, [http://www.cbr.ru/finmarkets/?PrtlId=sv\\_insurance](http://www.cbr.ru/finmarkets/?PrtlId=sv_insurance)



compared to the average figure. Financial literacy also does not seem to be the prevailing factor affecting the demand for and access to the financial services.

The NACFIN survey also demonstrates that personal characteristics can affect the demand for financial services. For example people who are careful with money, use demand deposits and savings accounts more often and car loans less often. People who value money very highly use payroll cards more often and car loans less often. People who are less careful with money prefer not to use financial services at all. However, these results are preliminary and need further investigation.

Our hypothesis is that the financial behaviour of a person can be influenced not only by the current individual characteristics or circumstances, but also by more basic and inherent characteristics determined by their inherent biological endowment.

### 3. Methodology and Data

In order to investigate whether individual biological characteristics—the level of PT, in our case—can affect individual consumption of financial services we estimate the Logit model, using the following specification:

$$Y_i = f(2D4D_i, 2D4D_i^2, Z_i) \quad (1)$$

$Y_i$  is a vector of binary variables measuring the usage of the following financial services:

- bankcards (whether a person uses bankcards for transactions, not only for cash withdrawal)
- bank loans (both intention to apply for a loan and loan already taken out)
- deposits (in banks and other financial institutions)
- insurance (life, property and auto insurances)

If a person uses (or has an intention to use) a particular financial product the corresponding binary variable equals to 1, otherwise its value is 0.

It is quite difficult to distinguish empirically access and use of financial services. The use can be affected by access and vice versa. Therefore, we separately consider the intention of individuals to borrow from a bank. Financial institutions can refuse credit to individuals due to their characteristics (income, age and etc.), which reflects rationing and, thus, the limitations in access to financial services rather than the demand for them.

Our explanatory variables include the measure of PT ( $2D4D_i$ ) of an individual and a set of control variables ( $Z_i$ ).

PT is measured by the ratio of the second finger length over the fourth finger length, the 2D:4D ratio. It is negatively correlated with the PT (Lutchmaya et al., 2004), (Hönekopp et al., 2007), (Sapienza et al., 2009), (Nye et al., 2012). We include the ratio for the right and left hands. The correlation between left-hand and right-hand ratios is 49%. We also include the squared form of the 2D:4D ratio to check for the non-linear dependency. Some studies show that PT has a non-linear (U-shaped) association with postnatal individual behaviour and achievements (see (Nye et al., 2012) for the analysis of the link between PT and academic achievements, (Sánchez-Domínguez et al., 2013) for the link between PT and mathematical grades, (Branas-Garza et al., 2013) for the link between PT and altruism, (Nye et al., 2014) for the link between PT and individual wages).

The sign of the link between financial services consumption and PT is not unambiguous. Individuals can have different motives for their use of financial products. As described in section 1, there can be prevention or promotion incentives when the goal is to avoid or to achieve financial gains. For some financial products the existing theories and empirical evidence predict both possible signs, we summarize both sets of arguments and then check which is supported by the data. Now we summarize our expectations for the sign of the link between PT and different financial services consumption.

For bank cards, those who use them more often are people who need them to manage their active way of life including activities such as purchases online, travelling. In (Plummer, 1971) using the US data of a national-wide survey (2200 respondents) the author shows that men who use cards more frequently enjoy active, urbane, open lifestyle<sup>12</sup>. These are definitely people with higher PT (lower 2D:4D ratio). Women similarly, but with an important exclusion: they seem to daydream more (they say they dream of travelling, luxury life, becoming a famous person) and are less tied to the real world (they spent much less time on housework). These characteristics also appear in (Adcock Jr., Hirschman, & Goldstucker, 1977), where male bank card users are shown to wish less frequently for “the good old days” and buy clothes more on impulse (according to a telephone survey of approx.1000 respondents in a metropolitan area in US). Women claim they are very active and up to date with most things around them, are willing to try new ideas and to take a word in any discussion.

However the same study shows that women using bank cards are at the same time rarely among those who act on the spur of the moment or change interests quickly and easily. They

---

<sup>12</sup> According to the survey, they enjoy living life without day-to-day routine, doing sports, going out, spending time with friends, drinking a cocktail before dinner and good wine during it.

behave as those with lower levels of PT, being more cautious. They could use bank cards more often in order to avoid risks (such as a theft) and to control their spending more carefully. So we might expect to find a U-shaped effect of the 2D:4D ratio on the probability of bank card use at least for women.

For bank loans, higher PT results in more male-type behaviour, which may lead to a more active way of life and, therefore, can demand and consume more bank loans in order to manage their needs. However lower PT makes people less impulsive and more forward-looking. They could apply more often for bank loans in order to smooth their consumption over time.

Depositors are usually those who save following precautionary principles and the smoothed consumption strategy, so they should be more frequent among people with lower PT.

Individuals high in PT can be more confident and less risk-averse. Therefore, they could consume less insurance products.

For insurance the most important concern seems to be risk-aversion. Individuals with a high level of PT could be more confident and less risk-averse, so they rarely buy insurance. They care about their health less: as shown in (Cardon & Hendel, 2001) those who buy health insurance are on average in better health than those who do not (according to National Medical Expenditure Survey, 13,000 households in the USA, 1987). The same result is demonstrated in (Sloan & Norton, 1997) on data from a US national cohort survey of people between 51 and 61 in 1992 (12,600 respondents). Moreover, (Cohen, Kumar, & Wallack, 1992) suggest that those who do not buy the health insurance rely heavily on the government and do not feel responsible for their own health care in future (according to the survey in USA by LifePlans Inc., approx 10,000 respondents). People low in PT, who are more cautious, could use insurance products more often in order to protect themselves from possible losses. As the results of (Cohen et al., 1992) show, those who buy health insurance are usually those who care about how to pay for future medical expenses. In addition, they more frequently feel it is important to rely on yourself (instead of the government) and to plan now for possible future expenses.

On the other hand, these people can be more careful in their everyday life trying to avoid any accidents. Therefore, they will need insurance products less. This will also help them to save money and, thus, to smooth consumption. So again we may expect to find a non-linear effect for the probability of buying insurance. Moreover, (Sloan & Norton, 1997) show that there is a non-linear effect of risk-aversion for health insurance: those who are less likely to buy insurance are moderately risk-averse, compared to those, who are highly risk-averse and have low risk-

aversion. This idea is supported by the results of (Stanton et al., 2011), showing that people with high and low levels of testosterone behave as risk-neutral, and those in-between are risk-averse<sup>13</sup>.

Control variables include possible factors influencing individual demand for and access to financial services. These factors are income, education, age and age squared, marital status, health and current life satisfaction. To avoid the influence of outliers we exclude the observations with the 2D:4D below 0.7 or above 1.4 (0.3% of the sample). Descriptive statistics are presented in Table 1.

**Table 1. Descriptive statistics**

Variable	Description	Obs	Mean	Std. dev.	Min	Max
<i>Financial services consumption</i>						
credit	Credit already taken (1 – yes, 0 - no)	2035	0.146	0.354	0.000	1.000
credit_intention	Intention to take a credit (1 –yes, 0 - no)	4381	0.029	0.167	0.000	1.000
deposit	Money deposited (1 – yes, 0 - no)	4429	0.031	0.173	0.000	1.000
card_for_transactions	Usage of bankcards for transactions, not only for cash withdrawal (1- yes, 0 - no)	2777	0.243	0.429	0.000	1.000
auto_insurance	Having the auto insurance (1 – yes, 0 - no)	2715	0.169	0.375	0.000	1.000
life_insurance	Having life insurance (1 – yes, 0 - no)	4431	0.036	0.185	0.000	1.000
property_insurance	Having property insurance (1 – yes, 0 - no )	4178	0.141	0.348	0.000	1.000
<i>2D:4D ratios</i>						
2D:4DI	Ratio of the second finger length over the fourth finger length on the left hand	4407	0.997	0.048	0.740	1.370
2D:4Dr	Ratio of the second finger length over the fourth finger length on the right hand	4407	0.997	0.047	0.740	1.350
<i>Controls</i>						
marital	Marital status (1 – married or living with a partner, 0 - otherwise)	4402	0.580	0.494	0.000	1.000
educ	Education (dummy, 1 – higher education)	4438	0.362	0.481	0.000	1.000
gender	Gender (1- male, 0 - female)	4438	0.413	0.493	0.000	1.000
age	Age, years	4438	43.395	18.924	12.000	96.000
salary	Respondent’s average monthly salary during the last 12 months	2173	28932.450	22363.430	0.000	350000
relative income (for robustness check)	Reflects self-assessment of a person concerning her level of income (discrete variable, from 1 to 9, 1 – a person considers herself to be among the poorest, 9 – the richest)	4390	4.030	1.381	1	9
life_sat	Current life satisfaction (dummy, 1 – satisfied with life, 0 – not satisfied)	4438	0.575	0.494	0	1
health	Current health self-reporting (dummy, 1 – good health, 0 – any health problems)	4438	0.366	0.482	0	1

There is a statistically significant difference between males and females with respect to PT and financial services consumption. Women demonstrate higher levels of 2D:4D and lower credit burden and incentives to borrow, lower proportions of life and auto insurance consumers, a higher share of property insurance consumers (see Table 2). Therefore, we carry out estimations separately for men and women in order to better capture the gender differences in financial products usage.

For the purposes of our analysis, we use data from the 20th round of the Russian Longitudinal Monitoring Survey<sup>14</sup> (RLMS-HSE), from October 2011 to February 2012. This is

<sup>13</sup> (Stanton et al., 2011) analyzes current testosterone in a particular game experiment, but we believe we can extend this observation for the PT and the life attitudes.

the only round to date, where the 2D:4D ratio was measured. Our sample includes 4438 individuals (41% males, 59% females) from Moscow and the Moscow region.

**Table 2. Gender differences in 2D:4D and financial**

Variable	Male		Female	
	Obs	Mean	Obs	Mean
2D:4D				
2D:4Dl***	1815	0.9952	2592	0.9985
2D:4Dr***	1815	0.9958	2592	0.9984
Financial Inclusion				
card_for_transactions	1175	0.2604	1602	0.2310
deposit	1829	0.0295	2600	0.0319
cred_intention***	1808	0.0354	2573	0.0241
credit***	392	0.1173	1643	0.1534
property_insurance***	1712	0.1308	2466	0.1480
life_insurance***	1829	0.0459	2602	0.0284
auto_insurance***	1220	0.1992	1495	0.1445

*Significant differences in means: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$*

#### 4. Results

According to our findings, biological endowment affects financial inclusion. Specifically, it has an impact on an individual's decision to use bank cards and to have a deposit, their intention to apply for a loan and on individual consumption of life and property insurance.

As Table 3 demonstrates, women with higher levels of PT (lower 2D:4D ratio both for the right and the left hands) more often use bank cards for transactions. However, this relation is non-linear and has a U-shaped form, as (Plummer, 1971) predicts (see Figure 6). The negative link exists until the point where the 2D:4D ratio equals to approximately 1 (both for the left hand and for the right hand) after which it becomes positive. Therefore, when the level of PT is relatively low its decrease is associated with a higher probability of bankcard use by females.

This U-shaped link can be explained by different motives behind the usage of bankcards. Specifically, women with higher levels of PT—more masculine type—can be involved in a more active lifestyle and, therefore, use more often bank services including bank cards for transactions. Moreover, they can be less risk-averse and can have the so-called promotion incentive when the aim is to get financial gains (as described in Section 1). On the other hand, women with a lower level of PT can be more risk-averse and, thus, more cautious and can use financial services in order to avoid financial losses (by at least avoiding carrying a lot of cash which can more easily be stolen) and to better control their spending and even smooth them by

---

<sup>14</sup> The RLMS-HSE is conducted by the National Research University Higher School of Economics and ZAO “Demoscope”, headed by Polina Kozyreva and Mikhail Kosolapov together with Carolina Population Center, University of North Carolina at Chapel Hill, headed by Barry M. Popkin and the Institute of Sociology RAS. <http://www.hse.ru/en/rlms/>

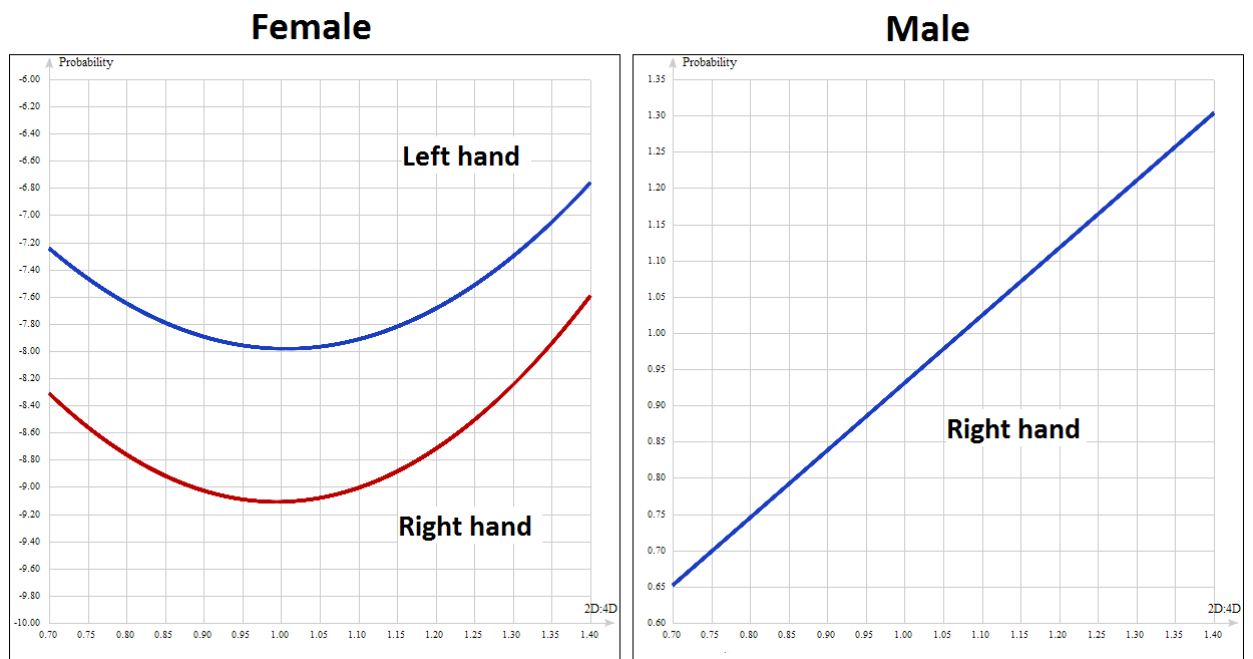
using the different special programs provided by the banks to card users (such as interest free overdraft, bonus and rewards programs).

**Table 3. Bank card use and 2D:4D (average marginal effects, s.e. in parentheses)**

Variable	(I)		(II)		(III)		(IV)	
	male	female	male	female	male	female	male	female
2D:4Dl	0.25604 (0.34172)	-0.05313 (0.31257)	3.60786 (6.78841)	-15.86841** (7.04989)				
2D:4Dl <sup>2</sup>			-1.65372 (3.35514)	7.88504** (3.51249)				
2D:4Dr					0.93107*** (0.34315)	0.30699 (0.31368)	4.57383 (8.57232)	-18.32256*** (6.62427)
2D:4Dr <sup>2</sup>							-1.80510 (4.24455)	9.21364*** (3.28579)
age	0.00437 (0.00943)	0.02018** (0.00847)	0.00453 (0.00943)	0.02007** (0.00846)	0.00421 (0.00941)	0.02012** (0.00847)	0.00435 (0.00941)	0.02061** (0.00844)
age <sup>2</sup>	-0.00007 (0.00012)	-0.00027*** (0.00010)	-0.00007 (0.00012)	-0.00027*** (0.00010)	-0.00007 (0.00012)	-0.00027** (0.00010)	-0.00007 (0.00012)	-0.00028*** (0.00010)
marital	0.05055 (0.04309)	0.04109 (0.02983)	0.05056 (0.04307)	0.03719 (0.02981)	0.05344 (0.04299)	0.04134 (0.02979)	0.05336 (0.04297)	0.03938 (0.02964)
educ	0.07429** (0.03313)	0.01959 (0.02983)	0.07287** (0.03323)	-0.02216 (0.02978)	0.07026** (0.03300)	0.02069 (0.02976)	0.06916** (0.03310)	0.02494 (0.02966)
salary	0.00000*** (0.00000)	0.00000*** (0.00000)	0.00000*** (0.00000)	0.00000*** (0.00000)	0.00000*** (0.00000)	0.00000*** (0.00000)	0.00000*** (0.00000)	0.00000*** (0.00000)
life_sat	-0.00242 (0.03361)	-0.05103* (0.02928)	-0.00198 (0.03361)	-0.05017* (0.02921)	0.00162 (0.03349)	-0.04959* (0.02928)	0.00083 (0.03354)	-0.04894* (0.02917)
health	0.02974 (0.03359)	0.04670 (0.02964)	0.02990 (0.03359)	0.04361 (0.02961)	0.02503 (0.03343)	0.04994* (0.02968)	0.02547 (0.03344)	0.04861* (0.02952)
Observations	795	981	795	981	797	982	797	982
chi <sup>2</sup>	40.32	39.29	40.54	44.04	43.04	41.95	49.33	51.28

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Figure 6. 2D:4D and probability of bank card use for transactions**



Other important determinants of bank card use by females are age (an inverse U-shaped relation), salary (a positive relation), health (better health corresponds to a higher probability of bank card use) and life satisfaction (a negative relation).

The effect of PT on bank card use is ill-defined for men. Lower levels of PT (higher 2D:4D ratio) are associated with a higher probability of bank card use. Nevertheless, this is evident only for the right hand. Other factors appear to be more important. Specifically, education and salary are positively associated with the use of bank cards by males.

**Table 4. Intention to apply for a loan and 2D:4D (average marginal effects, s.e. in parentheses)**

Variable	(I)		(II)		(III)		(IV)	
	male	female	male	female	male	female	male	female
2D:4Dl	-0.20665 (0.37273)	0.41107** (0.17406)	-8.03892 (8.18846)	2.97396 (4.19788)				
2D:4Dl <sup>2</sup>			3.97967 (4.16737)	-1.23847 (2.02685)				
2D:4Dr					-0.62345* (0.37382)	0.44033*** (0.16002)	-0.37066 (10.46441)	1.16675 (2.83765)
2D:4Dr <sup>2</sup>							-0.13033 (5.39244)	-0.34376 (1.34081)
age	0.00080 (0.00965)	0.01542** (0.00757)	-0.00091 (0.00980)	0.01556** (0.00758)	0.00128 (0.00969)	0.01541** (0.00740)	0.00131 (0.00978)	0.01532** (0.00740)
age <sup>2</sup>	-0.00001 (0.00012)	-0.00021** (0.00010)	0.00001 (0.00012)	-0.00021** (0.00010)	-0.00001 (0.00012)	-0.00021** (0.00010)	-0.00001 (0.00012)	-0.00021** (0.00010)
marital	-0.06705* (0.03645)	-0.00459 (0.01733)	-0.06441* (0.03619)	-0.00423 (0.01735)	-0.06226* (0.03541)	-0.00445 (0.01729)	-0.06229* (0.03545)	-0.00430 (0.01732)
educ	0.01829 (0.03694)	0.01015 (0.01671)	0.01985 (0.03751)	0.01049 (0.01673)	0.03004 (0.03813)	0.01000 (0.01679)	0.03001 (0.03814)	0.00975 (0.01680)
salary	0.00000** (0.00000)	0.00000 (0.00000)	0.00000** (0.00000)	0.00000 (0.00000)	0.00000** (0.00000)	0.00000 (0.00000)	0.00000** (0.00000)	0.00000 (0.00000)
life_sat	0.05966 (0.04523)	0.00336 (0.01650)	0.05561 (0.04511)	0.00367 (0.01653)	0.05880 (0.04420)	0.00689 (0.01670)	0.05870 (0.04439)	0.00658 (0.01673)
health	-0.05023 (0.03911)	0.01750 (0.01666)	-0.05519 (0.03951)	0.01883 (0.01679)	-0.04644 (0.03851)	0.01780 (0.01668)	-0.04634 (0.03876)	0.01778 (0.01668)
cred_ind	0.07310** (0.03671)	0.03437** (0.01703)	0.07259** (0.03664)	0.03433** (0.01704)	0.06218* (0.03552)	0.02939* (0.01670)	0.06215* (0.03554)	0.02895* (0.01678)
Observations	188	714	188	714	188	714	188	714
chi <sup>2</sup>	17.10	25.89	17.92	26.31	19.92	22.30	19.92	27.83

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

The results are different when we consider the intention of an individual to apply for a bank loan. In particular, females with lower levels of PT (higher 2D:4D ratio) and men with higher levels of PT (lower 2D:4D ratio for the right hand) more often intend to apply for a bank loan (see Table 4). The possible channel through which PT affects this type of financial decision is through individual attitude towards risk, as a current loan positively affects the probability that an individual intends to apply for a new loan as well. However, the motivation behind male and female decisions is different as females intend to apply for a loan more often if they are more risk-averse, while for the men this link is the opposite<sup>15</sup>.

<sup>15</sup> This conclusion is made based on the previous research with respect to the link between PT and risk-aversion discussed in section 1.

Other factors also seem to be important determinants of individual intention to apply for a bank loan. Age matters for females (an inverse U-shaped relation), while for men marital status (negative relation) and salary (positive relation) affect their intention to apply for a loan.

The PT level, measured at both hands, is a significant determinant of the women's propensity to be among bank depositors (see Table 5). Being more feminine—and more precautious and more caring about the future—women deposit more frequently. At the same time men's PT does not affect their depositing decisions.

Quite naturally depositors are more educated and wealthier respondents. For men the current health conditions are also important: those reporting not very good health, deposit more frequently—perhaps, in order to save more efficiently to cover future medical expenses.

**Table 5 Deposits and 2D:4D (average marginal effects, s.e. in parentheses)**

Variable	(I)		(II)		(III)		(IV)	
	male	female	male	female	male	female	male	female
2D:4Dl	-0.03079 (0.12140)	0.20500* (0.11973)	3.07714 (4.73787)	-0.32782 (2.43710)				
2D:4Dl <sup>2</sup>			-1.56182 (2.38169)	0.26035 (1.18947)				
2D:4Dr					0.00854 (0.11851)	0.21463* (0.12192)	-1.82198 (1.22245)	1.57571 (3.17034)
2D:4Dr <sup>2</sup>							0.89764 (0.58482)	-0.66530 (1.55116)
age	-0.00307 (0.00267)	-0.00039 (0.00275)	-0.00298 (0.00267)	-0.00041 (0.00275)	-0.00311 (0.00267)	-0.00042 (0.00276)	-0.00324 (0.00268)	-0.00049 (0.00275)
age <sup>2</sup>	0.00003 (0.00003)	0.00002 (0.00003)	0.00003 (0.00003)	0.00002 (0.00003)	0.00003 (0.00003)	0.00002 (0.00003)	0.00004 (0.00003)	0.00002 (0.00003)
marital	0.00659 (0.01356)	-0.00698 (0.01102)	0.00642 (0.01354)	-0.00710 (0.01103)	0.00665 (0.01352)	-0.00739 (0.01100)	0.00656 (0.01355)	-0.00721 (0.01100)
educ	0.03169*** (0.01225)	0.00854 (0.01179)	0.03134** (0.01223)	0.00853 (0.01179)	0.03148*** (0.01222)	0.00750 (0.01176)	0.03316*** (0.01246)	0.00726 (0.01175)
salary	0.00000 (0.00000)	0.00000*** (0.00000)	0.00000 (0.00000)	0.00000*** (0.00000)	0.00000 (0.00000)	0.00000*** (0.00000)	0.00000 (0.00000)	0.00000*** (0.00000)
life_sat	-0.00985 (0.01039)	0.00366 (0.01140)	-0.00963 (0.01041)	0.00365 (0.01140)	-0.00980 (0.01038)	0.00474 (0.01141)	-0.01000 (0.01038)	0.00478 (0.01140)
health	-0.02462** (0.01240)	0.00046 (0.01199)	-0.02397* (0.01236)	0.00026 (0.01204)	-0.02475** (0.01238)	0.00123 (0.01201)	-0.02595** (0.01254)	0.00130 (0.01201)
Observations	985	1,150	985	1,150	987	1,151	987	1,151
chi <sup>2</sup>	18.16	33.41	18.68	33.45	18.14	33.57	19.69	33.79

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**There are also some signs that biological endowment matters for individual variation in insurance consumption (see Table 6 and Table 7). Specifically, this is true for females. Women with lower levels of PT (higher 2D:4D ratio for the left hand) more often consume property insurance. This link is inverse U-shaped, as predicted in (Cohen et al., 1992) and (Stanton et al., 2011) (see Table 7. Life insurance and 2D:4D (average marginal effects, s.e. in parentheses)**

Variable	(I)		(II)		(III)		(IV)	
	male	female	male	female	male	female	male	female
2D:4Dl	0.17715 (0.16519)	-0.33125** (0.12946)	0.86776 (2.95675)	8.55937 (5.35553)				
2D:4Dl <sup>2</sup>			-0.33772 (1.44923)	-4.56589* (2.74925)				
2D:4Dr					0.25481 (0.16273)	-0.12058 (0.13485)	1.96193 (3.80642)	1.32976 (3.92300)



2D:4Dr <sup>2</sup>							-0.83780 (1.87483)	-0.72866 (1.97077)
age	-0.00579 (0.00438)	0.00515 (0.00378)	-0.00577 (0.00438)	0.00454 (0.00373)	-0.00551 (0.00444)	0.00563 (0.00383)	-0.00546 (0.00444)	0.00559 (0.00382)
age <sup>2</sup>	0.00006 (0.00005)	-0.00007 (0.00005)	0.00006 (0.00005)	-0.00006 (0.00005)	0.00005 (0.00006)	-0.00007 (0.00005)	0.00005 (0.00006)	-0.00007 (0.00005)
marital	0.01828 (0.02065)	0.03477** (0.01469)	0.01825 (0.02065)	0.03606** (0.01466)	0.01875 (0.02084)	0.03606** (0.01486)	0.01862 (0.02081)	0.03622** (0.01486)
educ	0.01207 (0.01589)	0.02139 (0.01345)	0.01167 (0.01597)	0.02192 (0.01342)	0.00951 (0.01598)	0.02354* (0.01355)	0.00843 (0.01612)	0.02327* (0.01356)
salary	0.00000*** (0.00000)	0.00000*** (0.00000)	0.00000*** (0.00000)	0.00000*** (0.00000)	0.00000*** (0.00000)	0.00000*** (0.00000)	0.00000*** (0.00000)	0.00000*** (0.00000)
life_sat	0.01574 (0.01691)	0.00928 (0.01278)	0.01586 (0.01692)	0.01023 (0.01282)	0.01820 (0.01708)	0.00913 (0.01286)	0.01819 (0.01708)	0.00909 (0.01285)
health	-0.02158 (0.01588)	0.00584 (0.01181)	-0.02161 (0.01589)	0.00503 (0.01177)	-0.02462 (0.01601)	0.00648 (0.01188)	-0.02435 (0.01599)	0.00652 (0.01188)
Observations	987	1,151	987	1,151	989	1,152	989	1,152
ch <sup>2</sup>	37.27	59.66	37.34	63.69	39.55	53.65	39.81	53.81

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

At the same time, women with lower levels of PT (the right tail) could be more cautious and attentive to details to keep the property in good condition (such as regularly checking the water and gas systems, paying attention to switching off the ovens and irons when leaving the property) to reduce the probability of any accident—so they less often consume property insurance in an effort to avoid additional spending on something that they can avoid themselves.

Females consume life insurance more often when their level of PT is lower. Being more cautious they could wish to avoid the costs of medical assistance as they cannot fully control the probability of the need for them (health conditions are not easily predicted).

For the insurance market the most important determinant seems to be individual income. For women other factors also have an impact on their consumption of insurance products: health (a negative relation for property insurance), life satisfaction (a positive relation for property insurance) and marital status (a positive relation for life insurance).

Figure 7). After the point where 2D:4D is slightly less than 1 the relation becomes the opposite: higher levels of PT are associated with a higher probability of property insurance consumption.

**Table 6. Property insurance and 2D:4D (average marginal effects, s.e. in parentheses)**

Variable	(I)		(II)		(III)		(IV)	
	male	female	male	female	male	female	male	female
2D:4DI	0.11015 (0.23663)	-0.31719 (0.23826)	6.90928 (7.39904)	12.50021* (7.43540)				
2D:4DI <sup>2</sup>			-3.38299 (3.70006)	-6.45813* (3.74211)				
2D:4Dr					-0.12080 (0.24108)	-0.28873 (0.24703)	13.07612 (8.29883)	1.00095 (6.01407)
2D:4Dr <sup>2</sup>							-6.61515 (4.16750)	-0.64465 (3.00498)
age	0.00191 (0.00622)	0.00249 (0.00580)	0.00213 (0.00622)	0.00245 (0.00578)	0.00269 (0.00627)	0.00256 (0.00579)	0.00301 (0.00626)	0.00250 (0.00580)
age <sup>2</sup>	-0.00001 (0.00008)	-0.00000 (0.00007)	-0.00001 (0.00008)	-0.00000 (0.00007)	-0.00002 (0.00008)	-0.00001 (0.00007)	-0.00002 (0.00008)	-0.00000 (0.00007)

marital	-0.00878 (0.02968)	-0.00537 (0.02263)	-0.00827 (0.02964)	-0.00307 (0.02263)	-0.00885 (0.02980)	-0.00391 (0.02261)	-0.00806 (0.02977)	-0.00369 (0.02263)
educ	0.00430 (0.02319)	0.03451 (0.02285)	0.00267 (0.02324)	0.03428 (0.02280)	0.00445 (0.02325)	0.03662 (0.02280)	0.00097 (0.02334)	0.03641 (0.02282)
salary	0.00000*** (0.00000)	0.00000** (0.00000)	0.00000*** (0.00000)	0.00000** (0.00000)	0.00000*** (0.00000)	0.00000** (0.00000)	0.00000*** (0.00000)	0.00000** (0.00000)
life_sat	0.04350* (0.02433)	0.03807* (0.02312)	0.04440* (0.02434)	0.03877* (0.02310)	0.04472* (0.02441)	0.03779 (0.02313)	0.04465* (0.02437)	0.03768 (0.02313)
health	-0.00606 (0.02291)	-0.04479* (0.02435)	-0.00535 (0.02294)	-0.04406* (0.02430)	-0.00642 (0.02292)	-0.04550* (0.02440)	-0.00492 (0.02287)	-0.04538* (0.02441)
Observations	930	1,095	930	1,095	932	1,096	932	1,096
chi <sup>2</sup>	21.18	26.60	22.45	30.35	21.28	26.44	25.00	26.51

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

This inverse U-shaped link can also be explained by the difference in the motives behind the consumption of insurance products. Women with higher levels of PT (the left tail) can be less risk-averse and, therefore, insure their property less often, which is natural.

**Table 7. Life insurance and 2D:4D (average marginal effects, s.e. in parentheses)**

Variable	(I)		(II)		(III)		(IV)	
	male	female	male	female	male	female	male	female
2D:4DI	0.17715 (0.16519)	-0.33125** (0.12946)	0.86776 (2.95675)	8.55937 (5.35553)				
2D:4DI <sup>2</sup>			-0.33772 (1.44923)	-4.56589* (2.74925)				
2D:4Dr					0.25481 (0.16273)	-0.12058 (0.13485)	1.96193 (3.80642)	1.32976 (3.92300)
2D:4Dr <sup>2</sup>							-0.83780 (1.87483)	-0.72866 (1.97077)
age	-0.00579 (0.00438)	0.00515 (0.00378)	-0.00577 (0.00438)	0.00454 (0.00373)	-0.00551 (0.00444)	0.00563 (0.00383)	-0.00546 (0.00444)	0.00559 (0.00382)
age <sup>2</sup>	0.00006 (0.00005)	-0.00007 (0.00005)	0.00006 (0.00005)	-0.00006 (0.00005)	0.00005 (0.00006)	-0.00007 (0.00005)	0.00005 (0.00006)	-0.00007 (0.00005)
marital	0.01828 (0.02065)	0.03477** (0.01469)	0.01825 (0.02065)	0.03606** (0.01466)	0.01875 (0.02084)	0.03606** (0.01486)	0.01862 (0.02081)	0.03622** (0.01486)
educ	0.01207 (0.01589)	0.02139 (0.01345)	0.01167 (0.01597)	0.02192 (0.01342)	0.00951 (0.01598)	0.02354* (0.01355)	0.00843 (0.01612)	0.02327* (0.01356)
salary	0.00000*** (0.00000)	0.00000*** (0.00000)	0.00000*** (0.00000)	0.00000*** (0.00000)	0.00000*** (0.00000)	0.00000*** (0.00000)	0.00000*** (0.00000)	0.00000*** (0.00000)
life_sat	0.01574 (0.01691)	0.00928 (0.01278)	0.01586 (0.01692)	0.01023 (0.01282)	0.01820 (0.01708)	0.00913 (0.01286)	0.01819 (0.01708)	0.00909 (0.01285)
health	-0.02158 (0.01588)	0.00584 (0.01181)	-0.02161 (0.01589)	0.00503 (0.01177)	-0.02462 (0.01601)	0.00648 (0.01188)	-0.02435 (0.01599)	0.00652 (0.01188)
Observations	987	1,151	987	1,151	989	1,152	989	1,152
ch <sup>2</sup>	37.27	59.66	37.34	63.69	39.55	53.65	39.81	53.81

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

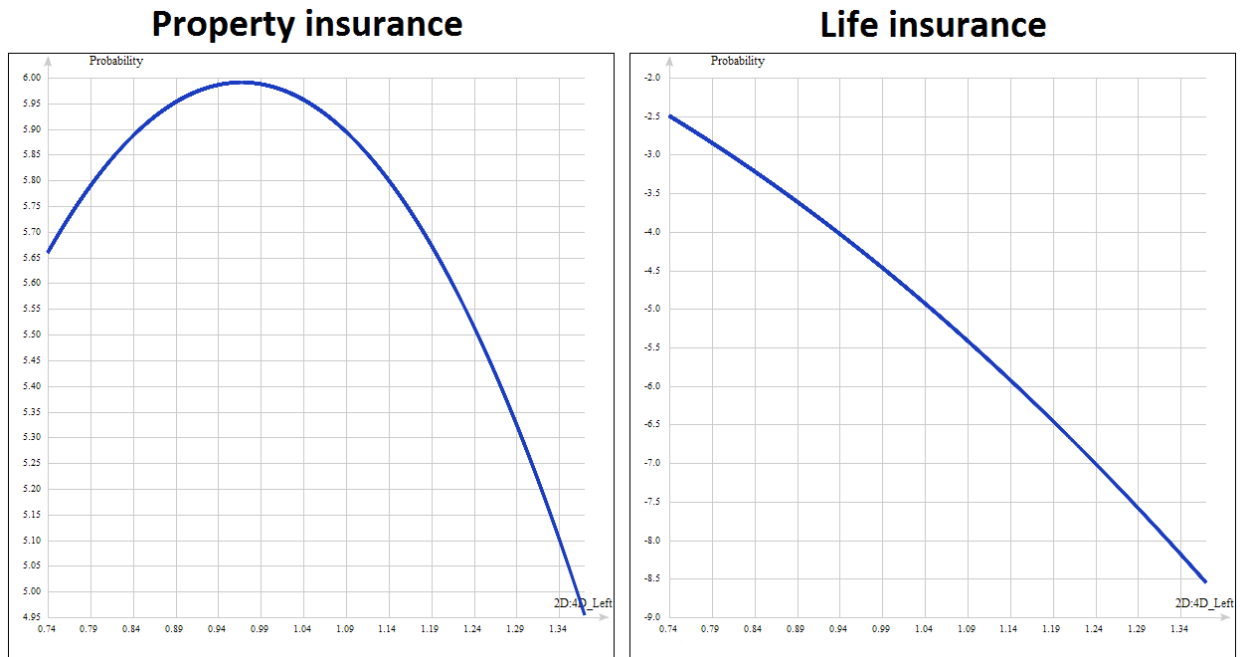
At the same time, women with lower levels of PT (the right tail) could be more cautious and attentive to details to keep the property in good condition (such as regularly checking the water and gas systems, paying attention to switching off the ovens and irons when leaving the property) to reduce the probability of any accident—so they less often consume property insurance in an effort to avoid additional spending on something that they can avoid themselves.

Females consume life insurance more often when their level of PT is lower. Being more cautious they could wish to avoid the costs of medical assistance as they cannot fully control the probability of the need for them (health conditions are not easily predicted).

For the insurance market the most important determinant seems to be individual income. For women other factors also have an impact on their consumption of insurance products: health

(a negative relation for property insurance), life satisfaction (a positive relation for property insurance) and marital status (a positive relation for life insurance).

**Figure 7. 2D:4D and probability of having insurance (female, left hand)**



We do not find any statistically significant results with respect to the inherent biological variation as a determinant of individual auto insurance consumption and current bank loans.

### 5. Robustness check: relative income

For the robustness check we employ a relative income variable instead of average monthly salary. The relative income reflects the individual perception of her income status as compared to others. The respondents imagine themselves to be on a 9-step ladder, from the poorest to the richest, and then asked on which step they see themselves.

The results remain relatively the same. According to the Table A 1 - Table A 5 in the Appendix, we can conclude that PT influences the behaviour of people with respect to the consumption of financial services. As Table A 2 demonstrates, the link between individual intention to apply for a loan and the level of PT is even more profound. Females with lower levels of PT more often intend to take out a loan. This is confirmed by the statistically significant positive link between 2D:4D ratio (both for the left-hand and the right-hand) and the dependent variable that reflects individual intention to take out a loan. For males this link is the opposite—men with higher levels of testosterone more often intend to take out a loan. This link not linear and has the inverse U-shaped form. The possible channel through which genetics matters for

females is the individual attitude towards risk as current credit positively affects the intention of women to take out more loans.

For men an important factor affecting their decision to take out a loan appears to be their life satisfaction and their perception of their relative income. When men do not consider themselves low-income and are more satisfied with their life, they more often intend to take out a loan. For females age plays a role when deciding whether to borrow. Older women more often decide in favour. However, the link is non-linear and has the inverse U-shaped form.

There is some evidence that people differ biologically in their usage of bankcards for transactions. However, the results reflect only a one-directional link both for men and for women: lower levels of PT are associated with a higher probability of bank card use (see Table A 1).

Other factors seem to be also important for a person to consume this type of the financial service. In particular, higher education is positively connected with the use of bankcards. Relative income and age are also statistically significant for the usage of bankcards by females. Women with higher levels of relative income and older females use bankcards more often (and this link is again inverse U-shaped). Life satisfaction (a negative relation) and individual health levels (a positive relation) also affect the use of bankcards by women.

The results for deposits are less stable. In the alternative modification we see no significant results for women, discussed above. However, we see a U-shaped relationship between PT and the propensity to deposit for men (see Table A 3). For low levels of PT its increase is associated with lower frequency of having bank deposits—as we show for women in the basic specification.

When we consider the insurance market, we can see some signs of the inherent biological variation in the use of property insurance. In line with our previous findings, females with lower levels of PT (higher 2D:4D ratio for the left hand) consume property insurance more often. And again this link is inverse U-shaped. The same result is evident for men. Among other factors affecting property consumption, education matters both for men and women (a positive relation) and health for women (a negative relation).

## **6. Conclusions**

The level of financial inclusion is an important characteristic of the overall financial development of a country. Therefore, it is necessary to examine its determinants to work out the appropriate policy in order to increase the use of financial services.

Many factors—socio-demographic and macroeconomic—have already been examined as possible determinants of financial inclusion. However, an important possible determinant—individual inherent biological variation—has been less studied. Nevertheless, it can substantially affect individual propensity to consume financial services, which, in turn, has an impact on the level of financial inclusion.

We fill this gap in the literature by investigating individual biological characteristics as a possible determinant of an individual decision to consume financial services. We employ the 2D:4D ratio, which is negatively correlated with the level of PT, formed prenatally and not affected by postnatal life.

According to our results, biological endowment affects financial inclusion. Specifically, it has an impact on the intention of a person to take out a bank loan, the use of bankcards, having a bank deposit and the consumption of property and life insurance products.

Many countries prioritise the enhancement of financial inclusion as a domestic policy goal. Therefore, more information with respect to possible determinants of demand for and access to financial services is necessary in order to develop an effective strategy for increasing financial inclusion. Hopefully, our results will add to the understanding of this issue.

## References

- Apicella C. L., Dreber A., Campbell B, Gray P.B., Hoffman M., Little A. C. “Testosterone and financial risk preferences”, *Evolution and Human Behavior*, Vol. 29, pp. 384–390 (2008)
- Beck T., Levine R., Loayza N. “Finance and the sources of growth”, *Journal of Financial Economics*, Vol. 58, pp. 261-300 (2000)
- Beck T., Demirguc-Kunt A., Martinez Peria M.S. “Reaching out: Access to and use of banking services across countries”, *Journal of Financial Economics*, Vol. 85, pp. 234–266 (2007)
- Bertrand M., Morse A. “Information Disclosure, Cognitive Biases, and Payday Borrowing”, *Journal of Finance*, Vol. 66, Iss. 6, pp. 1865–1893 (2011)
- Bosch-Domenech A., Branas-Garza P., Espin A. M. “Can exposure to prenatal sex hormones (2D:4D) predict cognitive reflection?” *Psychoneuroendocrinology*, Vol. 43, pp. 1-10 (2014)
- Branas-Garza P., Rustichini A. “Organizing Effects of Testosterone and Economic Behavior: Not Just Risk Taking”, *PLoS One*, DOI: 10.1371/journal.pone.0029842 (2011)
- Branas-Garza P., Kovarik J., Neyse L. “Second-to-Fourth Digit Ratio Has a Non-Monotonic Impact on Altruism”, *PLoS One* DOI: 10.1371/journal.pone.0060419 (2013)
- Brosnan M., Gallop V., Iftikhar N., Keogh E. “Digit ratio (2D:4D), academic performance in computer science and computer-related anxiety”, *Personality and Individual Differences*, Vol. 51, Iss. 4, pp. 371–375 (2011)
- Cesarini D., Johannesson M., Lichtenstein P., Sandewall O., Wallace B. “Genetic Variation in Financial Decision-Making”, *The Journal of Finance*, Vol. 65, Iss. 5, pp. 1725-1754 (2010)
- Claessens S. “Access to Financial Services: A Review of the Issues and Public Policy Objectives”, *World Bank Research Observer*, Vol. 21, Iss. 2, pp. 207-240 (2006)

- Clarke G., Xu L.C., Zou H. “Finance and Income Inequality: Test of Alternative Theories”, The World Bank Policy Research Working Paper 2984 (2003)
- Coates J. M., Gurnell M., Rustichini A. “Second-to-fourth digit ratio predicts success among high-frequency financial traders”, *PNAS*, Vol. 106, Iss. 2, pp. 623–628 (2009)
- Cole S., Sampson T., Zia B. “Prices or Knowledge? What Drives Demand for Financial Services in Emerging Markets?” *The Journal of Finance*, Vol. Lxvi, Iss. 6 (2011)
- Dabbs J. M. “Testosterone and Occupational Achievement”, *Social Forces*, Vol. 70, Iss. 3, pp.813-824 (1992)
- Dalton P., Ghosal, S. “Self-Confidence, Overconfidence and Prenatal Testosterone Exposure”, CentER Discussion Paper 2014-014 (2014)
- Demirguc-Kunt A., Klapper L. “Measuring Financial Inclusion: The Global Findex Database”, World Bank Policy Research Working Paper No. 6025 (2012)
- Duflo E., Saez E. “The Role of Information and Social Interactions in Retirement Plan Decisions: Evidence from a Randomized Experiment”, *Quarterly Journal of Economics*, Vol. 118, pp. 815-842 (2003)
- Fink B., Manning J. T., Neave N. “Second to fourth digit ratio and the “big five” personality factors”, *Personality and Individual Differences*, Vol. 37, Iss. 3, pp. 495–503 (2004)
- Golby J., Meggs J. “Exploring the organizational effect of prenatal testosterone upon the sporting brain”, *Journal of Sports Science and Medicine*, Vol. 10, Iss. 3, pp. 445–451 (2011)
- Hell B., Päßler K. “Are Occupational Interests Hormonally Influenced? The 2D:4D-interest Nexus”, *Personality and Individual Differences*, Vol. 51, Iss. 4, pp. 376–380 (2011)
- Higgins E. T. “Promotion and prevention: Regulatory focus as a motivational principle”, In M. E Zanna (Ed.), *Advances in experimental social psychology*, Vol. 30, pp. 1-46, New York: Academic Press (1998)
- Hönekopp J., Bartholdt L., Beier L., Liebert A. “Second to fourth digit length ratio (2D:4D) and adult sex hormone levels: New data and a meta-analytic review”, *Psychoneuroendocrinology*, Vol. 32, Iss. 4, pp. 313–321 (2007)
- Hönekopp J., Manning J. T., Müller C. “Digit ratio (2D:4D) and physical fitness in males and females: Evidence for effects of prenatal androgens on sexually selected traits”, *Hormones and Behavior*, Vol. 49, Iss. 4, pp. 545–549 (2006)
- Honohan P. “Financial Development, Growth and Poverty: How Close are the Links?” World Bank Policy Research Working Paper 3203 (2004)
- Jordan-Steen M. “Correlation Study between Second/Fourth Digit Ratio, Number of Older Brothers and Mathematics Inclination in Female Pre-service Teachers”, Proceedings of the World Congress on Engineering 2009 Vol II, WCE 2009, London, U.K. (2009)
- Kempel P., Gohlke B., Klempau J., Zinsberger P., Reuter M., Hennig J. “Second-to-fourth digit length, testosterone and spatial ability”, *Intelligence*, Vol. 33, Iss. 3, pp. 215–230 (2005)
- Kilduff L. P., Hopp R. N., Cook C. J., Crewther B. T., Manning J. T. “ Digit Ratio (2D:4D), Aggression, and Testosterone in Men Exposed to an Aggressive Video Stimulus”, *Evolutionary Psychology*, Vol. 11, Iss.5, pp. 953-964 (2013)
- Lusardi A., Mitchell O.S. “Baby boomers retirement security: the role of planning, financial literacy and housing wealth”, *Journal of Monetary Economics*, Vol. 54, pp. 205–224 (2007)
- Lusardi A., Tufano P. “Debt literacy, financial experiences, and overindebtedness”, NBER Working Paper 14808 (2009)

- Lutchmaya S., Baron-Cohen S., Raggatt P., Knickmeyer R., Manning J.T. “2nd to 4th digit ratios, fetal testosterone and estradiol”, *Early Human Development*, Vol. 77, pp. 23–28 (2004)
- Malas M. A., Dogan A., Evcil E. H., Desdicioglu K. “Fetal development of the hand, digits and digit ratio (2D : 4D)”, *Early Human Development*, Vol. 82, Iss. 7, pp. 469— 475 (2006)
- Manninga J. T., Bundred P.E., Newton D. J., Flanagan B. F. “The second to fourth digit ratio and variation in the androgen receptor gene”, *Evolution and Human Behavior*, Vol. 24, pp. 399 – 405 (2003)
- Manning J. T., Taylor R. P. “Second to fourth digit ratio and male ability in sport: implications for sexual selection in humans”, *Evolution and Human Behavior*, Vol. 22, Iss. 1, pp. 61-69 (2001)
- Moffit D. M., Swanik C. B. “The Association between Athleticism, Prenatal Testosterone, and Finger Length”, *Journal of Strength & Conditioning Research*, Vol. 25, Iss. 4, pp. 1085-1088 (2011)
- Nye J. V. C., Androuschak G. V., Desierto D., Jones G., Yudkevich M. M. “2D:4D Asymmetry and Gender Differences in Academic Performance”, *Plos One*, Vol. 7, Iss. 10 (2012)
- Nye J. V. C., Bryukhanov M. V., Polyachenko S. “2D:4D and Life Outcomes: Evidence from the Russian RLMS Survey” Higher School of Economics Research Paper No. WP BRP 78/EC/2014 (2014)
- Nye J. V. C., Yudkevich M., Orel E., Kochergina E. “The Effects of Prenatal Testosterone on Adult Wages: Evidence from Russian RLMS Data and Measured 2D:4D Digit Ratios”, Higher School of Economics Research Paper No. WP BRP 71/EC/2014 (2014)
- Nye J. V. C., Orel E. “The influence of prenatal hormones on occupational choice: 2D:4D evidence from Moscow”, *Personality and Individual Differences*, Vol. 78, pp. 39–42 (2015)
- Plummer, J. T. Life Style Patterns and Commercial Bank Credit Card Usage. *Journal of Marketing*, Vol. 35, No. 2, pp. 35–41 (1971).
- Rajan R.G., Zingales L. “Financial Dependence and Growth”, *The American Economic Review*, Vol. 88, No. 3, pp. 559-586 (1998)
- Sánchez-Domínguez A., Sánchez-Campillo J., Moreno-Herrero D., Rosales V. “Performance in mathematics and digit ratio: evidence from 500 university students”, Universidad de Granada Working Paper 13/04, available at <http://hdl.handle.net/10481/31585>
- Sapienza P, Zingales L., Maestripieri D. “Gender differences in financial risk aversion and career choices are affected by testosterone”, *Proceedings of the National Academy of Sciences (PNAS)*, Vol. 106, Iss. 36, pp. 15268-15273 (2009)
- Semenova M. “Save or borrow – what determines Russian households’ financial strategies?” / Working papers by Bank of Finland Institute for Economics in Transition. BOFIT Discussion Papers. 2011. No. 28.
- Stenstrom E., Saad G., Nepomuceno M. V., Mendenhall Z. “Testosterone and domain-specific risk: Digit ratios (2D:4D and rel2) as predictors of recreational, financial, and social risk-taking behaviors”, *Personality and Individual Differences*, Vol. 51, Iss. 4, pp. 412–416 (2011)
- Van Rooij M., Lusardi A., Alessie R. “Financial literacy and stock market participation”, *Journal of Financial Economics*, Vol. 101, pp. 449–472 (2011)
- Voracek M., Reimer B., Dressler S. G. “Digit ratio (2D:4D) predicts sporting success among female fencers independent from physical, experience, and personality factors”, *Scandinavian Journal of Medicine & Science in Sports*, Vol. 20, Iss. 6, pp. 853–860 (2010)

Wallace B., Cesarini D., Lichtenstein P., Johannesson M. “Heritability of ultimatum game responder behavior”, *PNAS*, Vol. 104, Iss. 40, pp. 15631-15634 (2007)

Zhou R., Tuan Pham M. “ Promotion and Prevention across Mental Accounts: When Financial Products Dictate Consumers’ Investment Goals”, *Journal of Consumer Research*, Vol. 31, Iss. 1, pp. 125-135 (2004)



# Appendix

**Table A 1 Bank card use and 2D:4D (average marginal effects, s.e. in parentheses)**

Variables	(I)		(II)		(III)		(IV)	
	male	female	male	female	male	female	male	female
2D:4DI	0.07334 (0.29987)	-0.07021 (0.25322)	1.59702 (5.75341)	-6.62120 (5.09852)				
2D:4DI <sup>2</sup>			-0.75502 (2.85013)	3.26816 (2.53987)				
2D:4Dr					0.63287** (0.30566)	0.28088 (0.25235)	4.19370 (7.63338)	-6.98906 (4.36298)
2D:4Dr <sup>2</sup>							-1.77493 (3.80185)	3.56587* (2.13943)
age	0.00478 (0.00734)	0.01777*** (0.00588)	0.00480 (0.00734)	0.01783*** (0.00589)	0.00435 (0.00733)	0.01767*** (0.00588)	0.00446 (0.00733)	0.01766*** (0.00588)
age <sup>2</sup>	-0.00010 (0.00009)	-0.00023*** (0.00007)	-0.00010 (0.00009)	-0.00024*** (0.00007)	-0.00009 (0.00009)	-0.00023*** (0.00007)	-0.00010 (0.00009)	-0.00023*** (0.00007)
marital	0.05627 (0.03656)	0.02303 (0.02480)	0.05645 (0.03657)	0.02178 (0.02481)	0.06030* (0.03646)	0.02350 (0.02477)	0.06023* (0.03644)	0.02325 (0.02475)
educ	0.13575*** (0.02780)	0.05039** (0.02366)	0.13495*** (0.02796)	0.05162** (0.02367)	0.13311*** (0.02772)	0.05052** (0.02364)	0.13225*** (0.02779)	0.05331** (0.02367)
relative_income_2	-0.00104 (0.12912)	0.33741*** (0.06443)	-0.00001 (0.12915)	0.33603*** (0.06491)	0.00868 (0.12639)	0.34054*** (0.06365)	0.00970 (0.12639)	0.33941*** (0.06341)
relative_income_3	-0.11000 (0.12152)	0.21990*** (0.05298)	-0.10977 (0.12149)	0.21909*** (0.05360)	-0.10128 (0.11880)	0.21998*** (0.05190)	-0.10029 (0.11881)	0.21981*** (0.05169)
relative_income_4	-0.12859 (0.12106)	0.20920*** (0.05189)	-0.12788 (0.12105)	0.20840*** (0.05254)	-0.11568 (0.11842)	0.21081*** (0.05086)	-0.11479 (0.11843)	0.21184*** (0.05065)
relative_income_5	-0.09175 (0.12159)	0.22642*** (0.05192)	-0.09119 (0.12157)	0.22602*** (0.05258)	-0.07836 (0.11896)	0.22764*** (0.05087)	-0.07756 (0.11896)	0.22722*** (0.05064)
relative_income_6	-0.11803 (0.12804)	0.29534*** (0.06184)	-0.11806 (0.12798)	0.29453*** (0.06238)	-0.10857 (0.12547)	0.29602*** (0.06093)	-0.10968 (0.12541)	0.29811*** (0.06077)
relative_income_7	0.05940 (0.13476)	0.27412*** (0.08133)	0.06005 (0.13476)	0.27156*** (0.08164)	0.07622 (0.13250)	0.27641*** (0.08076)	0.07705 (0.13253)	0.27596*** (0.08048)
relative_income_8	0.02156 (0.19946)	0.54104*** (0.14955)	0.02115 (0.19932)	0.53350*** (0.15079)	0.00554 (0.19516)	0.53936*** (0.14920)	0.01412 (0.19655)	0.54160*** (0.14915)
relative_income_9	-0.03228 (0.34256)		-0.03089 (0.34278)		-0.01420 (0.34215)		-0.01518 (0.34155)	
life_sat	-0.02088 (0.02971)	-0.05457** (0.02453)	-0.02062 (0.02972)	-0.05467** (0.02453)	-0.01930 (0.02961)	-0.05377** (0.02453)	-0.01998 (0.02964)	-0.05337** (0.02451)
health	0.02032 (0.03006)	0.05206** (0.02541)	0.02054 (0.03007)	0.05149** (0.02541)	0.01897 (0.02998)	0.05391** (0.02541)	0.01960 (0.03001)	0.05305** (0.02538)
Observations	1,084	1,479	1,084	1,479	1,087	1,480	1,087	1,480
chi <sup>2</sup>	45.89	60.40	45.94	61.93	47.88	62.96	51.53	66.64

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Table A 2 Intention to take a credit and 2D:4D (average marginal effects, s.e. in parentheses)**

Variable	(I)		(II)		(III)		(IV)	
	male	female	male	female	male	female	male	female
2D:4D1	-0.34059 (0.31095)	0.17458* (0.10485)	-1.18124 (6.42926)	2.38070 (2.94186)				
2D:4D1 <sup>2</sup>			0.42875 (3.27363)	-1.07720 (1.44204)				
2D:4Dr					-0.64109* (0.33472)	0.30995*** (0.09914)	-5.30383* (2.75303)	2.54875 (2.47927)
2D:4Dr <sup>2</sup>							2.36241* (1.31916)	-1.06310 (1.18464)
age	0.00581 (0.00714)	0.00526* (0.00313)	0.00571 (0.00717)	0.00513 (0.00313)	0.00744 (0.00760)	0.00555* (0.00312)	0.00755 (0.00765)	0.00530* (0.00309)
age <sup>2</sup>	-0.00008 (0.00008)	-0.00007* (0.00004)	-0.00008 (0.00008)	-0.00007* (0.00004)	-0.00010 (0.00009)	-0.00007** (0.00004)	-0.00010 (0.00009)	-0.00007* (0.00004)
marital	-0.01020 (0.02834)	-0.00644 (0.01138)	-0.00980 (0.02853)	-0.00635 (0.01136)	-0.00615 (0.02821)	-0.00616 (0.01130)	-0.00816 (0.02822)	-0.00624 (0.01129)
educ	0.04492 (0.03040)	0.01133 (0.01066)	0.04522 (0.03054)	0.01092 (0.01065)	0.05069 (0.03142)	0.01211 (0.01064)	0.05469* (0.03180)	0.01115 (0.01061)
cred_ind	0.04828 (0.03076)	0.02445** (0.01158)	0.04822 (0.03076)	0.02418** (0.01156)	0.04813 (0.03017)	0.02241** (0.01143)	0.05045* (0.03023)	0.02145* (0.01143)
relative_income_2		-0.06015 (0.06002)		-0.05797 (0.05870)		-0.04900 (0.05352)		-0.04832 (0.05255)
relative_income_3	-0.27157 (0.17631)	-0.05682 (0.05916)	-0.27063 (0.17648)	-0.05434 (0.05787)	-0.22016 (0.14660)	-0.04553 (0.05247)	-0.22992 (0.15022)	-0.04393 (0.05163)
relative_income_4	-0.25261 (0.17599)	-0.04495 (0.05962)	-0.25190 (0.17613)	-0.04201 (0.05834)	-0.20398 (0.14681)	-0.03415 (0.05290)	-0.21428 (0.15033)	-0.03313 (0.05195)
relative_income_5	-0.28060 (0.17583)	-0.06239 (0.05933)	-0.27990 (0.17592)	-0.06025 (0.05797)	-0.22886 (0.14636)	-0.05120 (0.05256)	-0.23667 (0.15011)	-0.04989 (0.05165)
relative_income_6	-0.25947 (0.18435)	-0.02886 (0.06315)	-0.25925 (0.18427)	-0.02715 (0.06176)	-0.21315 (0.15513)	-0.01654 (0.05695)	-0.22091 (0.15860)	-0.01563 (0.05610)
life_sat	0.00000 (0.00000)	0.00000 (0.00000)	0.00000 (0.00000)	0.00000 (0.00000)	0.00000 (0.00000)	0.00000 (0.00000)	0.00000 (0.00000)	0.00000 (0.00000)
health	0.00000 (0.00000)	0.00000 (0.00000)	0.00000 (0.00000)	0.00000 (0.00000)	0.00000 (0.00000)	0.00000 (0.00000)	0.00000 (0.00000)	0.00000 (0.00000)
Observations	0.05835*	0.00289	0.05836*	0.00303	0.06920**	0.00330	0.07379**	0.00296
chi <sup>2</sup>	17.68	27.30	17.70	28.08	20.44	28.76	22.08	35.66

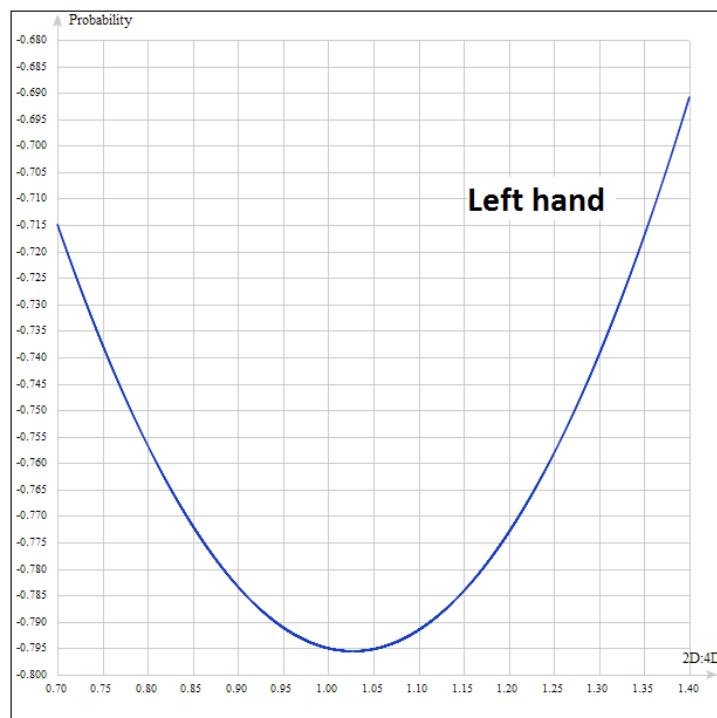
\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Table A 3 Deposits and 2D:4D (average marginal effects, s.e. in parentheses)**

Variables	(I)		(II)		(III)		(IV)	
	male	female	male	female	male	female	male	female
2D:4D1	-0.02875 (0.09913)	0.08836 (0.08211)	-1.54875* (0.91526)	1.07386 (1.78881)				
2D:4D1 <sup>2</sup>			0.75448* (0.44622)	-0.48269 (0.87959)				
2D:4Dr					0.02584 (0.09553)	0.07776 (0.08653)	-1.29578 (1.36157)	-0.14724 (1.38665)
2D:4Dr <sup>2</sup>							0.65160 (0.66430)	0.10959 (0.67318)
age	-0.00115 (0.00205)	0.00201 (0.00199)	-0.00132 (0.00206)	0.00200 (0.00198)	-0.00120 (0.00205)	0.00205 (0.00199)	-0.00120 (0.00205)	0.00206 (0.00199)
age <sup>2</sup>	0.00001 (0.00002)	-0.00001 (0.00002)	0.00001 (0.00002)	-0.00001 (0.00002)	0.00001 (0.00002)	-0.00001 (0.00002)	0.00001 (0.00002)	-0.00001 (0.00002)
marital	0.00410 (0.01128)	-0.00618 (0.00853)	0.00438 (0.01127)	-0.00606 (0.00852)	0.00427 (0.01124)	-0.00624 (0.00852)	0.00450 (0.01127)	-0.00625 (0.00852)
educ	0.03575*** (0.01003)	0.01435* (0.00835)	0.03723*** (0.01020)	0.01408* (0.00834)	0.03546*** (0.00998)	0.01420* (0.00834)	0.03614*** (0.01007)	0.01431* (0.00838)
relative_income_2	-0.01784 (0.03395)		-0.01931 (0.03527)		-0.01698 (0.03311)		-0.01733 (0.03370)	
relative_income_3	-0.01553 (0.03312)		-0.01667 (0.03447)		-0.01469 (0.03226)		-0.01530 (0.03282)	
relative_income_4	-0.00902 (0.03341)		-0.01120 (0.03473)		-0.00794 (0.03253)		-0.00885 (0.03309)	
relative_income_5	0.00643 (0.03402)		0.00466 (0.03531)		0.00705 (0.03318)		0.00649 (0.03374)	
relative_income_6	-0.00477 (0.03653)		-0.00552 (0.03794)		-0.00405 (0.03572)		-0.00425 (0.03633)	
relative_income_7	0.03066 (0.04572)		0.02930 (0.04674)		0.03234 (0.04531)		0.03173 (0.04570)	
relative_income_8	0.16735 (0.12786)		0.16871 (0.12870)		0.16719 (0.12713)		0.15844 (0.12361)	
relative_income_9	0.00000 (0.00000)		0.00000 (0.00000)		0.00000 (0.00000)		0.00000 (0.00000)	
life_sat	-0.00820 (0.00905)	0.00674 (0.00854)	-0.00922 (0.00911)	0.00669 (0.00853)	-0.00815 (0.00903)	0.00672 (0.00853)	-0.00802 (0.00902)	0.00672 (0.00853)
health	-0.02976*** (0.01101)	0.00007 (0.00985)	-0.02989*** (0.01101)	0.00029 (0.00985)	-0.02973*** (0.01100)	0.00010 (0.00986)	-0.03057*** (0.01111)	0.00008 (0.00986)
Observations	1,536	2,004	1,536	2,004	1,540	2,005	1,540	2,005
chi <sup>2</sup>	39.39	17.61	41.30	18.01	39.45	17.27	40.16	17.29

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Figure A 1 Deposits and 2D:4D, male (relative income model)**



**Table A 4 Property insurance and 2D:4D (average marginal effects, s.e. in parentheses)**

Variables	(I)		(II)		(III)		(IV)	
	male	female	male	female	male	female	male	female
2D:4DI	0.20133 (0.19002)	-0.15446 (0.17061)	11.00104* (6.54935)	10.85436** (5.26792)				
2D:4DI <sup>2</sup>			-5.37678 (3.26940)	-5.52793** (2.64407)				
2D:4Dr					-0.04296 (0.19492)	-0.07763 (0.17504)	8.82904 (6.05782)	5.53773 (4.63514)
2D:4Dr <sup>2</sup>							-4.43642 (3.03509)	-2.79255 (2.30784)
age	0.00059 (0.00416)	-0.00104 (0.00375)	0.00091 (0.00416)	-0.00107 (0.00374)	0.00081 (0.00418)	-0.00113 (0.00375)	0.00088 (0.00417)	-0.00119 (0.00374)
age <sup>2</sup>	0.00001 (0.00005)	0.00003 (0.00004)	0.00000 (0.00005)	0.00003 (0.00004)	0.00000 (0.00005)	0.00003 (0.00004)	0.00000 (0.00005)	0.00004 (0.00004)
marital	0.00597 (0.02289)	0.01094 (0.01706)	0.00574 (0.02286)	0.01321 (0.01706)	0.00681 (0.02294)	0.01139 (0.01706)	0.00683 (0.02292)	0.01235 (0.01707)
educ	0.03847** (0.01830)	0.06551*** (0.01636)	0.03542* (0.01832)	0.06452*** (0.01635)	0.03950** (0.01831)	0.06572*** (0.01636)	0.03773** (0.01832)	0.06423*** (0.01637)
relative_income_2	-0.08959 (0.06947)	0.03318 (0.05908)	-0.08386 (0.06847)	0.03466 (0.05848)	-0.08593 (0.06868)	0.03377 (0.05911)	-0.08545 (0.06797)	0.02949 (0.06069)
relative_income_3	-0.04904 (0.06805)	0.03332 (0.05603)	-0.04642 (0.06682)	0.03500 (0.05541)	-0.04648 (0.06716)	0.03285 (0.05603)	-0.04430 (0.06657)	0.02846 (0.05770)
relative_income_4	-0.06542 (0.06797)	0.04056 (0.05624)	-0.06073 (0.06682)	0.04339 (0.05563)	-0.06375 (0.06703)	0.04049 (0.05626)	-0.06135 (0.06644)	0.03649 (0.05792)
relative_income_5	-0.05313 (0.06826)	0.01710 (0.05608)	-0.04834 (0.06712)	0.01766 (0.05541)	-0.04795 (0.06742)	0.01704 (0.05610)	-0.04551 (0.06683)	0.01279 (0.05776)
relative_income_6	-0.00235 (0.07593)	0.06576 (0.06220)	-0.00073 (0.07458)	0.06598 (0.06149)	0.00150 (0.07527)	0.06624 (0.06224)	0.00012 (0.07444)	0.06039 (0.06370)
relative_income_7	0.09317 (0.08786)	0.07841 (0.07613)	0.09800 (0.08695)	0.07763 (0.07527)	0.09255 (0.08689)	0.07855 (0.07617)	0.09407 (0.08634)	0.07403 (0.07733)
relative_income_8	0.02843 (0.14481)	0.01572 (0.10277)	0.02682 (0.14162)	0.01884 (0.10361)	0.03033 (0.14448)	0.01658 (0.10325)	0.03857 (0.14757)	0.01147 (0.10386)
relative_income_9	0.30143 (0.35698)		0.31540 (0.35712)		0.28895 (0.35511)		0.28020 (0.35247)	
life_sat	0.00692 (0.01891)	0.02282 (0.01696)	0.00863 (0.01891)	0.02361 (0.01694)	0.00811 (0.01893)	0.02317 (0.01696)	0.00814 (0.01890)	0.02323 (0.01695)
health	-0.01796 (0.01962)	-0.04151** (0.01967)	-0.01659 (0.01962)	-0.04074** (0.01964)	-0.01894 (0.01961)	-0.04137** (0.01968)	-0.01731 (0.01960)	-0.04107** (0.01966)
Observations	1,456	1,976	1,456	1,976	1,460	1,977	1,460	1,977
chi <sup>2</sup>	32.71	42.20	36.97	48.03	31.45	41.51	32.03	43.91

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Table A 5 Life insurance and 2D:4D (average marginal effects, s.e. in parentheses)**

Variables	(I)		(II)		(III)		(IV)	
	male	female	male	female	male	female	male	female
2D:4D1	0.14275 (0.12330)	-0.19391** (0.08321)	2.34079 (3.60010)	2.79619 (2.63596)				
2D:4D1 <sup>2</sup>			-1.09307 (1.79309)	-1.52848 (1.34469)				
2D:4Dr					0.12854 (0.12073)	-0.05091 (0.08813)	1.58892 (3.11970)	-0.28425 (2.00022)
2D:4Dr <sup>2</sup>							-0.72232 (1.54517)	0.11605 (0.99338)
age	0.00252 (0.00307)	0.00642*** (0.00236)	0.00262 (0.00308)	0.00623*** (0.00234)	0.00285 (0.00312)	0.00647*** (0.00237)	0.00289 (0.00311)	0.00648*** (0.00237)
age <sup>2</sup>	-0.00005 (0.00004)	-0.00008*** (0.00003)	-0.00005 (0.00004)	-0.00008*** (0.00003)	-0.00005 (0.00004)	-0.00008*** (0.00003)	-0.00005 (0.00004)	-0.00008*** (0.00003)
marital	0.02133 (0.01538)	0.01169 (0.00909)	0.02094 (0.01539)	0.01248 (0.00911)	0.02184 (0.01552)	0.01207 (0.00912)	0.02181 (0.01551)	0.01204 (0.00913)
educ	0.03326*** (0.01156)	0.02621*** (0.00876)	0.03258*** (0.01158)	0.02602*** (0.00876)	0.03268*** (0.01155)	0.02632*** (0.00879)	0.03215*** (0.01159)	0.02638*** (0.00881)
relative_income_2	0.00000 (0.00000)	-0.02004 (0.04168)	0.00000 (0.00000)	-0.01910 (0.04084)	0.00000 (0.00000)	-0.01891 (0.04097)	0.00000 (0.00000)	-0.01894 (0.04097)
relative_income_3	0.00000 (0.00000)	-0.01834 (0.04069)	0.00000 (0.00000)	-0.01733 (0.03984)	0.00000 (0.00000)	-0.01772 (0.03990)	0.00000 (0.00000)	-0.01772 (0.03990)
relative_income_4	0.00000 (0.00000)	-0.01740 (0.04065)	0.00000 (0.00000)	-0.01605 (0.03981)	0.00000 (0.00000)	-0.01630 (0.03988)	0.00000 (0.00000)	-0.01631 (0.03988)
relative_income_5	0.00000 (0.00000)	-0.00555 (0.04097)	0.00000 (0.00000)	-0.00491 (0.04009)	0.00000 (0.00000)	-0.00444 (0.04019)	0.00000 (0.00000)	-0.00445 (0.04019)
relative_income_6	0.00000 (0.00000)	0.01715 (0.04355)	0.00000 (0.00000)	0.01794 (0.04270)	0.00000 (0.00000)	0.01908 (0.04288)	0.00000 (0.00000)	0.01921 (0.04291)
relative_income_7	0.00000 (0.00000)	-0.02066 (0.04310)	0.00000 (0.00000)	-0.01992 (0.04221)	0.00000 (0.00000)	-0.01914 (0.04247)	0.00000 (0.00000)	-0.01915 (0.04246)
relative_income_8	0.00000 (0.00000)	0.05840 (0.08032)	0.00000 (0.00000)	0.06216 (0.08187)	0.00000 (0.00000)	0.06706 (0.08416)	0.00000 (0.00000)	0.06695 (0.08409)
relative_income_9	0.00000 (0.00000)		0.00000 (0.00000)		0.00000 (0.00000)		0.00000 (0.00000)	
life_sat	0.02458* (0.01322)	0.01123 (0.00879)	0.02485* (0.01323)	0.01162 (0.00879)	0.02603* (0.01335)	0.01148 (0.00883)	0.02589* (0.01334)	0.01148 (0.00883)
health	-0.01361 (0.01177)	0.00377 (0.00821)	-0.01330 (0.01179)	0.00341 (0.00821)	-0.01515 (0.01184)	0.00409 (0.00826)	-0.01476 (0.01185)	0.00409 (0.00827)
Observations	1,503	2,065	1,503	2,065	1,506	2,066	1,506	2,066
chi <sup>2</sup>	58.72	55.68	59.21	57.45	59.68	50.48	59.94	50.49

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Corresponding author:

Maria Semenova

National Research University Higher School of Economics (Moscow, Russia).

Research Fellow at the Center for Institutional Studies

Associate Professor at the Department of Finance

E-mail: msemenova@hse.ru

**Any opinions or claims contained in this Working Paper do not necessarily reflect the views of HSE.**

© Andrievskaya, Semenova, 2016