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Konstantin Sergeyevich Shchemelinin (rus: Константин Сергеевич Щемелинин)

ORCID:0000-0002-3636-1583

LIFE BALANCE EQUATIONS FOR A PERSON AND FOR A FAMILY

Abstract. The equation of the life balance for an individual and for a family is derived based on the average salary in the country. It is shown that the total fertility rate directly depends on the cost of housing, on the amount of mortgage overpayment, on the cost of obtaining higher education, on the duration of compulsory secondary education, and also on the average of retirement life expectancy. Examples are given showing how much and why the total fertility rate is falling. On the basis of the life balance equation, it is possible to build any type of society according to the size of the birth rate: dying out, stable or increasing in number. A funnel of extinction is described for a society with insufficient fertility.

Keywords: *family, large family, birth rate, family budget, mortgage, housing, higher education, pension*

Average salary.

The basic unit for deriving the life balance equation is the average salary for a given country, and its median value will be the most accurate.

The average salary is the average salary of an ordinary person in normal working conditions during an ordinary life.

The average salary takes into account everything-both periods of unemployment, and segments of high or low incomes.

Assumptions

All calculations are approximate and estimated, but therefore they are applicable to any country and any social system.

Human Life Balance Equation

In Russian, the life balance equation for one person looks like this:

$$Ж = KB + И + P + BO + СУЩ + П$$

In English, the life balance equation for one person is written as follows:

$$L = FL + M + CH + HE + SUB + P$$

In these formulas:

a) Variables Ж and L are named from the words: Жизнь (Rus) and Life ("life" in English) and denote the sum of all salaries, subsidies, gifts, dividends and other income of the average person throughout his active life from the beginning of work to retirement.

b) The variables KB and FL are named from the words: Квартира (Rus) and Flat (in English) and indicate the market value of the apartment at the time of its purchase.

c) The variables И and M are named from the words Ипотека (Russian) and Mortgage (in English) and are the full overpayment on the mortgage loan: this includes all bank interest, insurance, and so on.

d) The variables P and CH are named from the words: Ребенок (Rus) and Child (in English) and denote the total cost of the birth and upbringing of one child under 18 years of age.

e) The variables BO and HE are named from the words: Высшее образование (Rus) and High education (in English) and denote the cost of obtaining one higher education, which includes both its payment and the maintenance of an actual adult for 4-6 years.

f) The СУЩ and SUB variables are named from the words: Средства к существованию (Rus) or Subsistence (in English) and denote the total cost of an adult over the course of his life; these costs include the purchase of food, clothing, household appliances, recreation, utilities, transport, purchase of a car (if most families in the country have a car) and much more.

g) Variables П and P are named from the words: Пенсия (Rus) and Pension (in English) and denote personal pension savings that a person can spend only after retirement (state pension is not included here).

Family Life Balance Equation

In Russian, the family life balance equation looks like this:

$$2*Ж = KB + И + Д1*P + Д2*BO + 2*СУЩ + 2*П, \text{ where}$$

Д1 and Д2 are the number of children who grew up and received higher education, respectively.

In English, the family life balance equation is written as follows:

$$2*L = FL + M + N1*CH + N2* HE + 2*SUB + 2*P, \text{ where}$$

N1 and N2 – the number of children who grew up and received higher education, respectively.

Examples of applying the Family Life Balance equation

Question №1. Why do countries with high levels of urbanisation and developed financial services have a combined birth rate of 1.5-2 children per woman? Why don't families have 3 or more children?

Lifetime income

The average person's average length of service during their entire active life from the beginning of employment to retirement is approximately 40 years (from 20 years to 60 years), so the income of such a person for his entire life is equal to:

$$L = 40 * 12 = 480 \approx 500 \text{ average salaries in the country.}$$

Lifetime expenses

1. Buying your own home

An ordinary person can save up for an apartment if they set aside the amount of money earned over 10-15 years of their life. Since people tend to start families, a one-room apartment will not be enough for a family, so to purchase a larger apartment, you need to spend an amount of money equal to or more than your earnings for 15 years of your life:

$$FL = 15 * 12 = 180 \approx 200 \text{ average salaries in the country.}$$

2. Overpayment for the mortgage.

Buying a home with a mortgage is a common type of real estate purchase. The usual overpayment can range from 50% to 150-200% of the original cost of the home, so for the purposes of this calculation, you can accept 100%:

$$M \approx F$$

3. Birth and upbringing of a child under 18 years of age.

The cost of giving birth and raising a child under the age of 18 is 100 average salaries in the country: $P = 100$ [1].

4. Getting a higher education by a young person.

Obtaining higher education includes both its payment and the maintenance of an actual adult for 4-6 years and can be estimated at 100 average salaries in the country: $HE = 100$

5. The cost of living for the most adult person.

An adult should spend on himself about half of all his income, that is, $SUB = 0.5 * L = 250$ average salaries in the country. If an adult spends less than one-third of the average salary on himself or herself every month during his or her entire life, then such a person is poor, and if he or she spends an average salary or more on himself or herself, then such a person is well-off.

The value of SUB should be equal to approximately 200-300 average salaries in the country is borderline: if SUS is more than 400-500 average salaries in the country, then such an adult is well-off, and his family is well-off; if the value of SUS is less than 150 average salaries in the country, then such an adult is poor, and his family is poor or a poor family.

6. Pension savings.

Pension savings can be assumed to be equal to 5% of all a person's income throughout his life: $P = 0.05 * L = 0.05 * 500 = 25$ average salaries in the country.

This figure is approximately equal to five years of a person's life after retirement with monthly pensioner expenses equal to 0.4 average payments in the country: $0,4 * 5 * 12 = 24$ average salaries in the country.

7. From the family life balance equation:

$$2 * L = F + I + D1 * CH + D2 * HE + 2 * SUB + 2 * P$$

you can find your parents' own expenses:

$$SUB = 1/2 * (2 * L - F - M - D1 * CH - D2 * HE - 2 * P)$$

Calculating the value of the value of entities for different types of families and comparing them with the values of entities from point 5 will answer in point 8 why families with 1 or 2 children are very common in the modern world.

8. We calculate the SUB for three types of families, each of which consists of two working adults and one, two and three children, respectively; in the first case, all children finish their education in school, and in the second case, all children receive a higher education.

Table №1. Means of subsistence (income) that an adult working person will spend on themselves throughout their life, in average salaries across the country

№	Family characteristics	L	F	M	D1*CH	D2*HE	P	SUB
Families who did not give their children a higher education								
1	2 adults and 1 child	500	200	200	100	0	25	225
2	2 adults and 2 children	500	200	200	200	0	25	175
3	2 adults and 3 children	500	200	200	300	0	25	125
Families who gave all their children higher education								
4	2 adults and 1 child	500	200	200	100	100	25	175
5	2 adults and 2 children	500	200	200	200	200	25	75
6	2 adults and 3 children	500	200	200	300	300	25	-25

Conclusion from table 1: the average modern family that has bought an apartment with a mortgage can easily raise one child without giving him a higher education, or it is difficult to raise one child by paying for a higher education.

Table №2. Means of subsistence (income) that an adult working person will spend on themselves over the course of their entire life, in average salaries across the country, excluding mortgages

№	Family characteristics	L	F	M	D1*CH	D2*HE	P	SUB
Families that did not give their children a higher education								
1	2 adults and 1 child	500	200	0	100	0	25	325
2	2 adults and 2 children	500	200	0	200	0	25	275
3	2 adults and 3 children	500	200	0	300	0	25	225
4	2 adults and 4 children	500	200	0	400	0	25	175
Families who gave all their children higher education								
6	2 adults and 1 child	500	200	0	100	100	25	275
7	2 adults and 2 children	500	200	0	200	200	25	175
8	2 adults and 3 children	500	200	0	300	300	25	75

Conclusion from Table 2: in the absence of a mortgage, the average modern family that has bought its own home can successfully raise three children without giving them higher education, or easily raise one child by paying for higher education.

The general conclusion from Tables 1 and 2: **the higher the mortgage overpayment and the more expensive higher education, the fewer children will be born in a given society – this is how housing, mortgages and education "kill" the birth rate.**

Question №2. How many children could there be in an ordinary family in a traditional society based on subsistence farming?

The life balance equation can also be applied to groups of people living today or previously in subsistence farming: traditional peasant communities, almost extinct hunter-gatherer societies, or nomads. In this case, the average monthly income in kind should be used instead of the national average salary.

Source data:

1. The cost of an apartment is very small: own housing is quite possible to make in a few months, so: $F = 5$ average monthly income.

2. Mortgage costs are zero: $M = 0$

3. The cost of higher education is zero $HE=0$.

4. Costs of having and raising a child: in traditional societies, children grow up early, starting to help their parents at the age of about 8-10 years, so the cost of raising one child is minimal: there is no kindergarten, there are no various toys, you don't need to learn to read and write, there is no maternity leave, and you don't need to buy baby food if it is necessary, there is no children's medicine, there is no secondary education, and so on. The cost of giving birth and raising a child in a traditional society can be taken as one-tenth of the P of a modern society, or $P = 100/10 = 10$ of the average monthly income.

5. The income of an adult working throughout his life in a traditional society from 14 to 30-35 years (you can take 32 years on average) is equal to:

$L = (32-14) * 12 = 18 * 12 = 216$ average monthly income excluding hunger.

From $L = 216$, you should subtract hungry or poor harvest years – they occur once every 6-7 years, that is, from 14 to 32 years, an adult will survive about three hunger strikes. During a famine, income in kind drops, for example, three to four times:

3 hungry years is a minus $3 * 12 * 0,75 = 27$ average monthly incomes.

Thus, taking into account the hungry years, the income of an adult for his entire life in a traditional society is equal to:

$L = 216-27 = 189 \approx 190$.

6. There is no pension provision in a traditional society, which means that there are no expenses for it either: $P = 0$.

7. An adult should spend half of their income on themselves, i.e. $SUB = L / 2 = 95$

Table №3. Means of subsistence (income) that an adult working person will spend on themselves over the course of their entire life, in average in-kind incomes in a traditional society

№	Family characteristics	L	F	M	D1*CH	D2*HE	P	SUB
1	to 2 adults and 1 child	190	0	0	10	0	0	185
2	of 2 adults and 2 children	190	0	0	20	0	0	180
3	2 adults and 3	190	0	0	30	0	0	175

	children							
4	2 adults and 4 children	190	0	0	40	0	0	170
5	2 / 5 children	190	0	0	50	0	0	165
6	2 adults and 6 children	190	0	0	60	0	0	160
7	2 adults and 7 children	190	0	0	70	0	0	155
8	2 adults and 8 children	190	0	0	80	0	0	150
9	2 adults and 9 children	190	0	0	90	0	0	145
10	2 adults and 10 children	190	0	0	100	0	0	140
11	2 adults and 11 children	190	0	0	110	0	0	135
12	2 adults and 12 children	190	0	0	120	0	0	130
13	2 adults and 13 children	190	0	0	130	0	0	125
14	2 adults and 14 children	190	0	0	140	0	0	120
15	2 adults and 15 children	190	0	0	150	0	0	115
16	2 adults and 16 children	190	0	0	160	0	0	110
17	2 adults and 17 children	190	0	0	170	0	0	105
18	2 adults and 18 children	190	0	0	180	0	0	100
19	2 adults and 19 children	190	0	0	190	0	0	95
20	2 adults and 20 children	190	0	0	200	0	0	90

Conclusions from Table 3.

1. In a traditional society based on subsistence farming, without large housing costs, without mortgages, without pension provision, with undeveloped medicine and without the need for education, an ordinary family has the economic opportunity to raise about 20 children.

Given the approximate calculations, this figure should be written as an interval: from 15 to 25 children.

2. The main regulators of fertility in traditional societies are not economic factors, but other ones, such as the biological fertility of an ordinary woman, the periodic onset of hunger, undeveloped medicine, and so on.

Question №3. How does the length of a pensioner's survival time affect the birth rate?

Survival time is defined as the length of time that the average pensioner will live from the age of retirement to his or her death.

Table 4. Means of subsistence (income) that an adult working person will spend on themselves throughout their life, in average salaries across the country, depending on the length of life of a pensioner

№	Family characteristics	L	F	M	D1*CH	D2*HE	P	SUB
Family with a mortgage of 2 adults and 1 child without higher education								
1	5 years	500	200	200	100	0	25	225
2	10 years	500	200	200	100	0	50	200
3	15 years	500	200	200	100	0	75	175
Family with a mortgage of 2 adults and 1 child with higher education								
5	5 years	500	200	200	100	100	25	175
6	10 years	500	200	200	100	100	50	150
Family without a mortgage of 2 adults and 2 children with higher education								
7	5 years	500	200	0	200	200	25	175
8	years 10	500	200	0	200	200	50	150
Family without a mortgage of 2 adults and 1 child without higher education								
9	years 5	500	200	0	100	0	25	325
10	years 10	500	200	0	100	0	50	300
11	15 years	500	200	0	100	0	75	275
12	years 20	500	200	0	100	0	100	250
13	of 25 years	500	200	0	100	0	125	225
Family without a mortgage of 2 adults and 2 children with no higher education								
14	5 years	500	200	0	200	0	25	275
15	years 10	500	200	0	200	0	50	250
16	15 years	500	200	0	200	0	75	225
17	20 years	500	200	0	200	0	100	200

Conclusion from Table 4: A sustainable society with a total fertility rate of about 2 can be built under the following conditions:

A) The average age of survival should not exceed the retirement age by more than 10 years.

B) There should be no mortgage, that is, over 90-95% of all real estate should be sold without using a mortgage.

C) Higher education should not be given to children, that is, at least 90-95% of people in society should not have a higher education.

Only if all these three conditions are met does the size of the society become stable, but if at least one of these conditions is violated, then the total birth rate radically drops below 2, and the society begins to steadily die out.

The Extinction Funnel

Society can fall into the funnel of extinction due to the demographic transition, the essence of which is a significant increase in family spending on the upbringing and education of a child [2, pp. 132-137]. In addition, the birth rate is influenced by cultural attitudes in society [2, p. 131], as well as the current historical process of transition from traditional marriage to a certain future marriage through the modern form of marriage [3].

Initial conditions for calculating the extinction funnel: most real estate is sold on a mortgage, half of families give their children a higher education, and the average pensioner lives 10-15 years in retirement.

Table 5. Means of subsistence (s) that an adult working person will spend on themselves over the course of their entire life, in average salaries across the country under the conditions of the extinction funnel

№	Среднее время дожития	L	F	M	D1*CH	D2*HE	P	SUB
P1 Family with a mortgage of 2 adults and 1 child with a higher education								
1	15 years	500	200	200	100	100	75	125
Family with a mortgage of 2 adults and 1 child without a higher education								
2	15 years	500	200	200	100	0	75	175
Family with a mortgage of 2 adults and 1 child without a higher education								
3	15 years	500	200	200	200	0	75	125

Conclusion from Table 5: all families living in a society caught in the extinction funnel live poorly ($SUB = 250$ and $SUB < 200$), and the total fertility rate is equal to the arithmetic average between 2 and 1, that is, about 1.5 and persists for several generations. The bottom of the extinction funnel is reached when mortgages and higher education become inaccessible to the majority of the population – in this case, the total birth rate will naturally rise to 2 (you need to have 2.1).

The bottom of the extinction funnel is achieved by:

A) There is a difference between the duration of operation of real estate, the life time of a person and the time of generational change: that is, real estate purchased in the first generation can serve for another 2-3 generations, as a result of which they can be mortgage-free.

B) Poverty prevents families from providing their descendants with higher education.

How many generations will pass before the bottom of the extinction funnel is reached is unknown, but it is likely that at least three generations will pass.

Conclusions:

1. The life balance equation for an individual and for a family is derived based on the average salary in the country.

2. The total birth rate directly depends on the cost of housing, on the amount of mortgage overpayment, on the cost of obtaining higher education, on the duration of compulsory secondary education [4], as well as on the average life expectancy of pensioners.

3. The cost of education and purchasing your own home radically reduces the total birth rate in the country.

4. A modern average family that has bought an apartment with a mortgage can easily raise one child without giving them a higher education, or it is difficult to raise one child by paying for a higher education.

5. In the absence of a mortgage, a modern average family that has bought its own home can successfully raise three children without giving them higher education, or easily raise one child by paying for higher education.

6. A family that is not burdened with the desire to find their own housing, as well as secondary and higher education for their children, has economic opportunities for the birth and upbringing of 15 to 25 children.

7. An extinction funnel for societies with insufficient fertility is described.

References

1. Shchemelinin K. S. Money. Simferopol.: IT "Arial". 2014. P. 16 (in Russian).

2. Shchemelinin K. S. Basis and recommendations for a radical raising of the total fertility rate // Scientific journal NovaUm.Ru. 2020. № 29 (in Russian).

3. Shchemelinin K. S. Differences between modern marriage and traditional marriage and principles for improving the quality of heterosexual marriage in modern society // Scientific journal NovaUm.Ru. 2020. №. 24. P. 151-160 (in Russian).

4. Shchemelinin K. S. Scheme and principles of school education, which by the age of 18 will form a spiritually free, creatively developed, healthy and patriotic specialist // Alley of Science. 2018. No. 1 (17). Volume 4. P. 233-247 (in Russian).