The Method for Determining Time-Generation Range

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Abstract
This article aims to develop a method for identifying generational cohorts based on the quantitative indicators underlying the change in generational phases according to Strauss and Howe. The scientifically substantiated differentiation between generational cohorts makes it possible to subsequently reveal the similar characteristics of people within these generational groups. The main result is a method for determining groups of generations, which includes five main stages: determining indicators-identifiers of generations, creating the initial database of indicators, compiling evaluation tables, dividing generations into groups by each indicator, comparing the obtained groups, and distributing the population by groups by indicators-identifiers of generations. The indicators-identifiers of generations used by the authors include natural population growth and gross domestic product. These indicators show the growth of the country’s most important resources, that is, human and economic resources, and make it possible to determine the moment of appearance of a new generation. The method for identifying the time ranges of generations and the results of applying this method (in modern Russia) make it possible to use the obtained information to solve various economic and social problems: study the features of representatives of certain generations, forecast the signs and time of the emergence of new generations in society, and so on. The proposed method can be used in scientific research and in practice, first, to evaluate the existing generations in a certain country, to substantiate measures promoting the transition of a society to the following development stages of generations, and for marketing purposes.

Keywords
Baby Boomers, birth cohorts, cohort analysis, cohort segmentation, generational cohort, Generation X, Generation Y, Generation Z, gross domestic product, millennials

Introduction
In modern scientific works, dedicated to various subjects, increased attention is paid to the division of society into homogeneous groups. Economic, sociological, psychological, and other differences between groups of people require further study as they influence the results of the development of society. If one takes into account the objectively existing important features of specific groups of the population, this creates a sound scientific basis for purposeful influence on such groups to achieve the goals of governance and regulation in society.

A relatively recent theory of generations that has appeared in science offers a new approach to the segmentation of population. To date, there are already a significant number of works devoted to distinguishing between the generational cohorts in various countries, especially in the United States. At the same time, almost all of them are based on the expert assessment of the distinction between generations formed under the influence of certain external events specific to individual countries. Works, where generations are distinguished based on quantitative estimates, are scarce.

The lack of a common approach requires the development of accurate methods for determining generational cohorts, which highlights the relevance of this work.

The purpose of this article was to develop methods for determining the time ranges of generational cohorts based on the use of quantitative indicators.

A Critical Overview of Modern Classifications of Generations
Currently, the concept of a generation has a wide variety of meanings. As noted in modern literature, there are at least four different interpretations of this term, including biological,

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genealogical, demographic, historical, and cultural (Semenova, 2003). At the same time, the one most widely used in practice is the sociological interpretation of this concept. Until a certain time, generations were studied without a serious systemic approach, until a theory of generations was founded by American scholars Strauss and Howe (1991).

Strauss and Howe (1991) define a generation as the totality of people born in the same period of about 20 years (in one phase of life). The most famous Russian researchers of generations—Shamis and Nikonov (2017)—note that a generation is a group of people with the same values, born during a certain period, having experienced the same external events in childhood and having received similar upbringing.

The unique characteristics of individual generations are formed at a young age, and later, only their further development occurs (Ortega y Gasset, 1997).

Modern scientific works contain many authors’ classifications of generations that have differences in the range of years of belonging and names.

Strauss and Howe (1991, 1997) identify and describe various generations, denoting an approximate period of belonging to a particular generation of 20 years. The Russian scientists Shamis and Nikonov (2017, 2018) also adhere to the grouping of generations given by the American scientists and carry out a detailed study of the features of two of them in their works.

Other Russian researchers attempted to adapt the theory of Strauss and Howe to the specifics of Russia. For example, Levada (2001), Miroshkina (2017), and Semenova (2003) propose their own classification of generations and their time ranges, which differs from the American one.

In the study by Levada (2001), generations change approximately every 10 years, and only by the end of the 20th century do their groups cover births in the range of 15 to 20 years. According to Miroshkina (2017), on the contrary, most of the 20th-century groups of generations cover a 20-year period, although by the end of the last century, the time range of a generation is reduced to 10 years. Similar grouping is given by Semenova (2003): At the beginning of the 20th century, generations are represented by a 20-year period; in the middle of a century, by a 10-year period; and at the end of a century, a generation again spans 20 years.

In foreign studies, attempts have also been made to adapt the theory of generations to the characteristics of individual countries. For example, Ting et al. (2018), the scientists from Malaysia, identified in their country generational cohorts, each of which covered a period of about 20 years.

At the same time, there are studies in which the features of generations are denied, where changes in people’s qualities are explained by technical progress (Watcom Group, 2018). Representatives of this view, in fact, deny the effect of education and the external environment on the formation of the features of people who grew up in different historical periods. There are also studies that call for a moratorium on the application of the ideas of generations in theory and practice (Rudolph et al., 2018). Such authors consider that it is correct to divide people by ages.

In this study, the authors attempt to justify the division of time ranges of generation groups using a quantitative method, which allows for the consideration of generations as an economic phenomenon that can be modeled using precise quantitative tools that have not been sufficiently developed today.

Strauss and Howe (1991, 1997) identify 25 generations in the history of the United States, four of which compose the modern population: Baby Boomers and Generations X, Y, and Z. Also, American scientists discovered a four-stage cycle of development of generations, which includes “the High” (generation of Baby Boomers), “the Awakening” (Generation X), “the Unraveling” (Generation Y) and “the Crisis” (Generation Z). Differences in generation cycles are based on the predominance of either social values or individual values in society during different generational periods (Wikipedia, 2018). Today, the studies by Strauss and Howe provide the most comprehensive information available about the characteristics of generations. However, the ranges of years of belonging to each of the generations proposed in their works do not have any kind of evidence based on computational methods.

Russian-based scholars Shamis and Nikonov (2017, 2018), studying Russian generations, adhere to the terminology of American scientists. They thoroughly study and describe all the main characteristics of Baby Boomers and Generation X under the conditions of Russian reality. However, they do not offer quantitative methods for determining the time ranges of generations.

Levada (2001) singled out six generations in the Russian practice of the 20th century: “Revolution,” “Stalinism,” “War,” “Thaw,” “Stagnation,” and “Perestroika.” In implementing this classification, the ranges of years of each generation are proposed by the author based on his own expert opinion on the basis of historical events in the country.

There is also a study by Miroshkina (2017), where she offers six generations of the 20th to 21st centuries for Russia: “Revolutions,” “Winners,” “Cold War,” “Restructuring,” “First Non-Soviet,” and “Digital.” At the same time, the periods of years of belonging of certain generations by the said researcher are given without any quantitative substantiation.

In addition, there is a quite interesting classification by Semenova (2003), which offers the following four generations for the 20th century: “Paramilitary,” “Pre-perestroika,” “ Transitional Period,” and “Post-perestroika.” At the same time, the ranges of years of belonging to individual generations are determined by the author subjectively according to a sociological survey of a certain set of people.

The Malaysian scientists Ting et al. (2018) identify five generations for their country in the 20th century, including “Battling-Lifers,” “Idealistic-Strugglers,” “Social-Strivers,” “Prospective-Pursuers,” and “Neoteric-Inheritors.” Their research also did not include the use of quantitative methods.
In some scientific papers, the concepts of age and generational groups of population are often mixed (Gorshkov et al., 2007), which is wrong. The age characteristics of people also exist, and each generation, the representatives of which are at a certain age, acquires characteristics inherent in the respective age groups (Timofeeva, 2017). However, the generational characteristics are unchanged and remain with people throughout their lives.

Thus, the study of existing works that classify generations shows that, in the presented studies, there is no sufficient information to make it possible to single out independent generations based on objective quantitative assessment.

Currently, the main part of the population of Russia and other countries is represented by four generations: Baby Boomers and Generations X, Y, and Z. As of the beginning of 2018, these four generations made up 96% of the total population of the Russian Federation, provided that the population of Russia is divided according to the time ranges of American generations put forward by Strauss and Howe (Federal State Statistic Service, 2018). According to the American time ranges for generations, in Russia Baby Boomers (1943–1960 years of birth) accounted for 23%; Generation X (1961–1981 years of birth), 29%; Generation Y (1982–2004 years of birth), 23%; and Generation Z (2005–2018 years of birth), 20%. All other older generations occupied a small share in the total volume of the population of Russia—only 4%.

As the Russian population is mainly represented by four generations, their further study in this work will be limited to the above-specified composition of groups.

### Definition of the Indicators of Differences Between Generations

As noted in the definition of the concept of generation, external events and education are the main factors in the formation of independent generations; therefore, this study has the task of finding quantitative indicators that could comprehensively reflect the influence of these factors on the differences between generations.

Strauss and Howe (1991, 1997) in their studies identified four successive phases of generations, the so-called four-stage cycle of changes in the generational phases.

The authors of this work suggest indicators for identifying generations based on the study of their qualitative characteristics, summarized in the studies by Strauss and Howe (1991, 1997), which are presented in Table 1 (the names of generations are presented according to Strauss and Howe).

This article proposes to measure the impact of external events and upbringing, determining the development of generations, based on the dynamics of two main indicators: natural population growth (NPG) and gross domestic product (GDP) at constant prices, as these indicators determine the differences between generation phases.

The statistical indicator “NPG” can be called added population. The statistical indicator “GDP at constant prices” reflects a comparable value added, calculated without taking into account the influence of inflation. A generation that has increased in number compared with the previous one provides a further significant increase in value added at comparable prices in the following two generation phases.

Table 1 reflects that “the High” is the period of the birth of Baby Boomers when social values prevail over individual values. As a result of this orientation of people, the most numerous generation of the cycle appears, but at the same time the increase in value added is quite slow.

“The Awakening” is the period of the emergence of Generation X, when social values begin to give way to the individual ones. At the same time, population growth slows down, whereas the increment of value added occurs at a more dynamic pace.

“The Unraveling” is the time of formation of Generation Y, when the orientation of people toward individual values has a peak in its development. As a result, this situation leads to a further decrease in NPG (and perhaps even to the reduction of the population), but the increase in value added gets its greatest value.
“The Crisis” is the phase of the emergence of Generation Z, when, to restore the population and ensure the further growth of value added, the society is once again reoriented toward social values. As a result of such a situation, this is followed by a gradual increase in population growth (or a reduction in its decline), but the increase in value added at comparable prices in this period still remains small and may even temporarily acquire a negative value.

**Method for Determining the Time Range of Generations**

Well-known publications about specific groups of generations are actively criticized in the literature, and the main reason for this criticism is the low level of empirical and quantitative evidence for the proposed groups.

Giancola (2006) notes in his work that no major research works on the study of generations, which would provide empirical evidence for the theory of generations, have been published in the United States. Hoover (2009) also claims in the theory of generations that there are no clearly classified differences in generations.

At the same time, there are many works that study the value orientations of the already present generational cohorts in different countries. From this point of view, the most interesting works are by Noble and Schewe (2003), Hung et al. (2007), Stewart et al. (2017), Martínez-Buelvas and Jaramillo-Naranjo (2019), and Etezady et al. (2020).

The American scientists Noble and Schewe (2003) study belonging to a generational cohort based on seven value indicators. They used discriminatory analysis for their research. However, the time ranges of generational cohorts are set in the work from the very beginning, that is, are not calculated. As a result of the study, it is concluded that it is difficult to forecast belonging to a generational cohort based on the values of the individual due to a significant error of prediction.

Hung et al. (2007) in their work divide the population of China into generational cohorts based on the study of the distinctive characteristics of the population in different age groups. At that, the belonging of people to certain generational cohorts is determined without any calculations, but by expertise. Thereafter, the authors study the differences in consumer values of generational cohorts of people using correlation and regression analysis.

Stewart et al. (2017) study the already present generational groups set as the original value. Their work focuses on studying the differences between generations in the United States and identifying the characteristics of millennials based on the calculation of the share of various indicators in the total volume of indicators.

Martínez-Buelvas and Jaramillo-Naranjo (2019) also consider the predefined generation groups of Colombia and discuss the differences between generations in the perception of the quality of working life. The indicators of differences between cohorts are directly analyzed based on the analysis of the respondents’ consistency, correlation, and one-sided analysis of variance (ANOVA).

Etezady et al. (2020) explore the differences between generations in the United States by four indicators, using the Blinder–Oaxaca decomposition method. However, they also consider the predefined time ranges of generations.

Thus, almost all available publications on generations study their differences, but there are no works aimed at determining the time ranges of generations. Researchers set the time ranges of generations as the initial condition, without any calculated basis of definition.

However, some works do use quantitative methods for differentiating between the generational cohorts. One should, in particular, mention the work by Fernández-Durán (2016), applying logistical regression to the data on people’s values obtained through a nationwide survey.

Fernández-Durán (2016) in his study identified generational cohorts in Mexico based on the analysis of points of change in indicators and the construction of logistic regressions. As the initial indicators for the assessment, the data of the 2010 nationwide survey on the values of different age groups of the population were used. The author suggested using a set of indicators characteristic of a particular generational cohort to exert a stronger impact on the consumer behavior of this cohort for marketing purposes.

In connection with the above, in view of the insufficient number of studies devoted to the development of quantitative methods for determining cohorts of generations, in this article, the authors consider it necessary to propose another method and then test it using Russia as the example.

According to the authors, to identify periods of belonging to generations, it is necessary to take into account the arguments that determine the existence of an independent generation:

1. Generations must have common indicators, by which they are differentiated, as the groups of generations that are distinguished according to different characteristics may differ significantly;
2. The 18-year-old range of belonging to a generational group is minimal, as the ability to have descendants is the right of adults;
3. The values of generations in the 20th and 21st centuries in different countries are in many respects identical due to globalization processes in the world, which makes the generations quite similar. This is substantiated in the studies by some authors (Edmunds & Turner, 2005). Therefore, it is advisable to use the names of generations, the most famous in world practice, proposed by Strauss and Howe (1991, 1997).

Table 2 contains the statistics of Russia for some years, which are proposed by the authors as the main years for distinguishing generations. Due to the large array of initial
Table 2. Indicators for the Development of Generations of Russia, in 1945–2015.

| Generations by Strauss and Howe | Year | Natural population growth (NPG), million people | Average annual NPG for the next 5 years (including the specified year), million people | Belonging to the generation by the NPG factor | Gross domestic product (GDP) at constant prices, billion rubles | Average annual GDP at constant prices for the next 5 years (including this year), billion rubles | Belonging to the generation by the GDP factor |
|--------------------------------|------|-----------------------------------------------|-----------------------------------------------|---------------------------------------------|------------------------------------------------|------------------------------------------------|---------------------------------------------|
| Baby Boom Generation           | 1945 | +0.4                                          | +1.2                                          | Baby Boom                                   | . . .                                          | . . .                                          | . . .                                          |
|                                | 1950 | +1.7                                          | +1.8                                          | Generation                                   | . . .                                          | . . .                                          | . . .                                          |
|                                | 1955 | +1.9                                          | +1.9                                          | Generation                                   | . . .                                          | . . .                                          | . . .                                          |
|                                | 1960 | +1.9                                          | +1.6                                          | . . .                                        | . . .                                          | . . .                                          | . . .                                          |
| Generation X                   | 1965 | +1.0                                          | +0.9                                          | Generation X                                 | . . .                                          | . . .                                          | . . .                                          |
|                                | 1970 | +0.8                                          | +0.8                                          | . . .                                        | . . .                                          | . . .                                          | . . .                                          |
|                                | 1975 | +0.8                                          | +0.8                                          | . . .                                        | . . .                                          | . . .                                          | . . .                                          |
|                                | 1980 | +0.7                                          | +0.8                                          | . . .                                        | . . .                                          | . . .                                          | . . .                                          |
| Generation Y                   | 1985 | +0.7                                          | +0.8                                          | . . .                                        | . . .                                          | . . .                                          | . . .                                          |
|                                | 1990 | +0.3                                          | −0.3                                          | Generation Y                                 | 1                                              | 34                                            | Y                                            |
|                                | 1995 | −0.8                                          | −0.8                                          | 550                                          | 1,919                                         | . . .                                          | . . .                                          |
|                                | 2000 | −1.0                                          | −0.9                                          | 5,045                                        | 9,570                                         | . . .                                          | . . .                                          |
| Generation Z                   | 2005 | −0.8                                          | −0.5                                          | 18,114                                       | 28,744                                        | . . .                                          | . . .                                          |
|                                | 2010 | −0.2                                          | −0.1                                          | 40,550                                       | 59,620                                        | . . .                                          | . . .                                          |
|                                | 2015 | +0.0                                          | −0.0                                          | 77,210                                       | 82,645                                        | . . .                                          | . . .                                          |

Source. Compiled by the authors according to official statistics (Federal State Statistic Service, 2017a, 2017b).
Note. Dots ( . . . ) denote information that is not available in official statistics due to a different data system in Russia in the premarket period.

information, as well as taking into account the gradual transition from one generation to another, the data in the table are taken at 5-year intervals.

The time ranges belonging to Russian generations will be determined by the quantitative assessment of the indicators, which are the basis of the division of generations, based on data in Table 2.

The study of NPG, which is the first indicator in the table, shows that an increase in this indicator and its maximum values were observed from 1945 to 1964, which made it possible to attribute this period to the generation of Baby Boomers. Furthermore, from 1965 to 1989, a gradual small reduction in NPG began, which made it possible to attribute this period to Generation X. From 1990 to 2009, there was a rapid fall in NPG, and even its natural decline occurred, which determined this range as a period of Generation Y. Finally, from 2010 to 2018, the natural population significantly decreased and a small increase in NPG began, making it possible to attribute this period to Generation Z.

Further study of the second indicator—GDP at constant prices—became possible for Russia only since 1990, because until that time a statistical information system existed in the country that did not provide for the definition of this indicator. The study of comparable indicators of GDP showed that its significant rapid growth was observed from 1990 to 2014 (doubling or better every 5 years), which served as the basis for attributing this period to Generation Y. The range from 2015 to 2018 was attributed to Generation Z and it was characterized by a slowdown in the growth of the studied indicator during this period.

As for Generation Z the estimates of the two studied parameters (NPG and GDP) have discrepancies, a study of annual data was necessary. An additional study showed that the increase in NPG in Russia began only from 2013, and GDP growth at constant prices practically ceased in 2014, which served as the basis for the final determination of the range of Generation Z from 2013 to 2018 (i.e., from the first years of recovery of positive NPG to the present).

The main groups of generations currently living according to the terms of Strauss and Howe (1991, 1997), as well as the grouping of generations carried out by the authors of this work, are presented in Table 3.

According to the classifications of Strauss and Howe, the range of years that form each succeeding generation increases over the course of the 20th to 21st centuries. The authors of this article explain the extension of the range of the period of belonging to each subsequent generation in the United States by the growth of the average age of birth of firstborns, as a result of which the emergence of subsequent generations is delayed in time; the strengthening of state regulation of internal order in the country, which leads to greater stability in society and the immutability of values; and the gradual convergence of individual countries, which also stabilizes the external conditions of life and education in the state.

In the classification of the generations of Russia, determined by the authors of this work, the range of years for each generation has certain differences from the American model. As the table shows, the range of years of belonging to each generation in Russia is greater than in the United States, which indicates a slower development of generations. As a
result, all the generations of Russia of the last four-stage cycle completed their formation later than in the United States, including Baby Boomers—by 4 years, Generation X—by 8 years, and Generation Y—by 8 years. The oldest representatives of Generation Z in Russia are 5 years old, which does not allow for a detailed study of the features of its representatives.

In the large cities of Russia with a population of more than 1 million people, group assessment of generations is significantly different from the above. For example, Moscow, which is one of the leading centers for the development of the digital economy and “smart” cities not only in Russia but also in the world, already has an almost fully formed Generation Z. By making calculations using the method proposed above, one can confirm this statement.

Results

The conducted analysis makes it possible to conclude that there are three main generations in Russia that occupy a significant share in the modern structure of the country’s population: Baby Boomers, Generation X, and Generation Y. The youngest Generation Z in Russia has just appeared and is in the formative stage.

To draw this conclusion, the authors developed and tested a method for identifying the time ranges of generational cohorts based on the four-stage cycle of changes in generational phases according to Strauss and Howe. This method uses official statistics data on population growth and GDP. These data were used to analyze the dynamics of annual indicators in increments of 5 years and average indicators for 5-year periods.

The main stages of calculations within the framework of the methodology are given below.

1. The identification of key indicators-identifiers of generations.

To distinguish between generations, the authors propose two indicators: NPG (added population) and GDP at constant prices (added value at comparable prices). These indicators reflect the increment of the resources of the nation, which can be accurately quantified.

2. The formation of the initial database on the proposed indicators for the years. To do this, one must make the appropriate selection of statistical data on these indicators.

3. The compilation of the evaluation table with the indication of the moment data on the studied indicators every 5 years and with the determination of the average data for the corresponding 5-year periods.

4. The primary distinction between the cohorts of generations separately for each of the two indicators studied.

When studying NPG and GDP at constant prices, the new generation stands out if in the presented dynamic series the subsequent indicator has significantly changed relative to the previous one (more than twofold). The assessment involves analyzing not only the moment data in 5-year increments but also the average over 5 years to eliminate the error. If the moment and average annual data in the table have different dynamics, additional indicators are studied by year within a 5-year period, for the correctness of the distribution of years between two border generations.

5. The final determination of time ranges of generations by comparing the estimates made for each of the two studied parameters.

Table 3. Generations in the Modern Population, in 2018.

| Name of generations | Strauss and Howe (for the United States) | Authors of the article (for Russia) |
|---------------------|----------------------------------------|-----------------------------------|
|                     | Years of birth | Range, years | Age, years | Years of birth | Range, years | Age, years |
| Baby Boom Generation | 1943–1960      | 18           | 58–75      | 1945–1964      | 20           | 54–73      |
| Generation X        | 1961–1981      | 21           | 37–57      | 1965–1989      | 25           | 29–53      |
| Generation Y        | 1982–2004      | 23           | 13–36      | 1990–2012      | 23           | 6–28       |
| Generation Z        | 2005–2018+     | 13+          | 0–13+      | 2013–2018+     | 5+           | 0–5        |

Source. Compiled by the authors according to the studies (Strauss and Howe, 1991, 1997; Wikipedia, 2018) and Table 2.
the appraiser’s opinion, and available in any country’s statistics. Thus, the authors see the prospect of further development of this research and the possibility of obtaining new results.

**Recommendations**

The authors suppose that further research will be related to identifying the specifics of the behavior of representatives of the obtained generations (first, consumer behavior), as well as to the possibility to forecast the time of emergence of new generations in future society.

The available publications note that different generations are characterized by specific behaviors in all areas of human activity. The features of generations are also manifested in their behavior as consumers of goods and services (Gindi et al., 2016; Jackson et al., 2011; Lissitsa & Kol, 2016; MacDonald et al., 2013; Spáčil & Teichmannová, 2016).

This work has shown that the dynamics of the country’s population and GDP are the external macroeconomic indicators that make it possible to differentiate between generations. In the case of using the same method for identifying generations, the time ranges of generational cohorts vary from country to country. It is possible to extend the duration of time ranges of individual generations in the case of ensuring the necessary dynamics of population and GDP. The time ranges of Generation Z, which in Russia are very far behind other countries, including the United States, should be minimized by government enforcement actions, as this generation within the four-stage cycle of generational phases corresponds to a crisis. Russia needs a faster transition to generations of “the High” and “Awakening,” which will ensure maximum population growth followed by a dynamic increase in the country’s GDP. This will promote a higher standard of living in the country and enhance the stability of society.

**Declaration of Conflicting Interests**

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

**Funding**

The author(s) received no financial support for the research, authorship, and/or publication of this article.

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