

## Optimization and the Geometric Ratio Model and Its Application to Higher Education In The Future

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**ABSTRACT:** For the countries to survive starting from the last quarter of the 21st century, it is needed to have "Critical economy of scale, Critical population size of scale, Well-trained population ratio of scale, and Critical technology development of scale". Populations will also learn, also in practice, whether countries, states and nations have the problem of existence since it will also be seen practically in practice starting from the last quarter of the 21st century.

In this model, it was aimed to investigate how the high school graduates should be trained in higher education and the quality of this training were investigated. According to this model, 85,7% of those who graduated from high school should continue to higher education, and of these students, 20% should attend two-year colleges, while 40% are to attend schools of higher education, and the rest 40% are to attend faculties. For the M.A. programs, 60% of the graduates of these should be accented, while  $\frac{1}{4}$  of the graduates should attend the Ph.D. programs.

The general population ratio has been calculated as 6,25% as Ph.D. and higher, 18,75% as M.A. graduates, 40% as B.A. graduates, 20% as vocational higher schools, and 15% of high school graduates. In the general population, 25% of those who completed high schools were calculated as the critical population. The active working population ratio is composed of the graduates of bachelor programs and high schools as 75%. In order to reach the desired proportions in this model, 35 years is needed to realize 80% of the system. However, the whole system needs 45-50 years to realize it. In other words, this model was designed based on the needs to be born due to the development of the countries. The model allows the changes within itself in any condition.

**KEYWORDS:** Higher education, Optimization, Planning human resources

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### I. THE SCALE SIZE POPULATION IN THE FUTURE

For the countries to survive in the future and starting with the last quarter of the 21st century, it is needed to have "(a) Critical economy of scale, (b) Critical population size of scale, (c) Well-trained population ratio of scale, and (d) Critical technology development of scale". These population countries will find out whether they have the problem of surviving in practice since it will be clearly observed in practice.

In the future, the economy of the world will face biological, technological and unmanned wars rather than the competitive and real wars. In short, there will be asymmetrical and all types of proxy wars. Pertaining to this, it would be necessary to ask the following questions:

- Critical economy of scale,
- Critical population size of scale,
- Well-trained population ratio of scale,
- Critical technology development of scale,

It is also more important to find answers to these questions than asking them. Countries, states, and governments are required to find solutions to these questions. If countries do not or cannot find solutions to these problems, they may not have their own future. These questions are:

### a. Critical Economy Of Scale

The critical economy of scale is defined as the costs decreasing while the production is increasing. This appears as a very general definition. The basic philosophy here is considered the reduction of the unit costs of the goods and services and contribution of them to the economy. It is strived to achieve a competitive situation by using very different Technologies and techniques in the production of goods and services. Negative scale economy is the situation in which the costs of production are increasing. The economy of coverage is the production of goods and services by companied. In this way, companies increase their competitive power by reducing their costs. These are the rules of the economy or the trade.

The definition above is known as the classics define of economy of scale. In the current study, we assign a different meaning as “Critical Economy of Scale”. In this meaning, we define any product as an economy in a size that will meet the needs of the world as a monopoly. More clearly, the population of a country may be relatively small. However, any product as a monopoly in the World can be under control in the free market conditions. We assign a new meaning to this situation as “Critical Economy of Scale”. Therefore, we use it differently, rather than its common use.

Why is this new definition needed? The answer to this problem is that beginning with the last quarter of the 21st century; countries may not or cannot can produce many goods for various reasons. This can be due to a variety of reasons, such as the lack of human resources, raw materials and technology. Nevertheless, a small-scale country can produce a strategic goods as a monopoly and obtain all its revenues through this product. We call this sustainable population size as the “Critical Economy of Scale.

### b. Critical Population Size Of Scale

This scale represents the population carrying out the basic research and producing technology in a country. For example, it represents all of the experts working in the nuclear field in the US or Russia. Another represents the core R&D staff of Apple and Microsoft. Similar Technologies are within this group. The critical population size of scale is the group that can be ahead of other countries in terms of competition or even create new important goods that will appeal to the whole World. Every country has the responsibility and the obligation to train a critical population size of scale. For his reasons, it appears as a crucial problem for every country.

### c. Well-trained Population Ratio Of Scale

As a proportion of this, 75% of the high-school graduates must be employed directly in the staff doing the daily work of the industry. We regard the other 25% as a critical well-educated population ratio for the selection and training of scientists who will do the R&D activities for the future of the country. This is the process in this 25% conducted to determine the people with the superior intelligence or the possible potential and educate them very well. The purpose of this study is to find the young human resources that might be potentially gifted in this crowd.

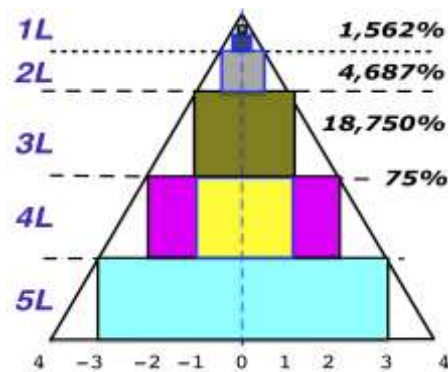
It represents the population that creates and produces all the science and technological innovations and the best product available in terms of trade. This area includes the people that produce the best ice cream, the best bread, pastry and service. For this reason, this group also includes more of the people who can do their job well than those who are well educated. Most of these people may not have a good education; however, they can do their job perfectly. For example, a cook can be a good example for this.

### d. Critical Technology Development Of Scale

This scale represents the technological products produced in a country, which are the products that cannot be produced by other countries. These are more high-tech areas. The production of many products such as nuclear reactor production, fuel production for space rocket engines, strategic epidemics vaccines, critical drugs, passenger plane production, computer chips such as CPU, APU, GPU, precision sensor are the most clear examples of this area. In other words, it can be defined as the production of monopolistic goods that are considered to be very strategic and competitive for the countries.

## II. GEOMETRIC RATIO MODEL

In this study, the baseline study for a higher education planning was conducted for the future by using the geometric ratio model [1-2]. It has been tried to determine the percentage of people who will work in the real economy. This model has been developed for the selection process of these people. The basic principle structure of this model is shown in Figure 1. The model was also based on high school education and was divided into proportional layers. Each layer represents a different level of teaching and education. In addition, it also comprises the general staff structure of the public and private sectors. It directly determines the structure of the human resource employed. As a result, we think it is very important.



**Figure. 1. The training ratios of the young population as education and training: (5L: High school graduates, 4L: Bachelor, college and vocational high school, 3L: Master, 2L: Ph.D. programs, 1L: Post-graduate studies)**

### 2.1. Layer 5L:

Layer 5L represents the student community that has graduated from all high schools that opened in accordance with the law. For this reason, there is no sex or school discrimination. The size of this section is the largest within the total size. This size is accepted as 100 units. 85,71% of these units are the students who can continue to a higher education level. The other 14,24% consists of high school graduates that will not be able to continue their education. How can this group be most beneficial to the economy or when they work, how can they benefit economy? This is the basic question. How should these high school graduates prepare for business life? Many of these questions are the questions to which the governors should find solutions. Moreover, these are the daily problems that they should solve.

### 2.2. LAYER 4L:

This layer represents the higher education in a country and consists of three basic units. This higher education consists of two-year colleges, higher schools, and the faculties. The ratios among them are: faculties as 40%, higher schools as 40%, and two-year colleges as 20%. The selection of the students for these is conducted in two ways.

Acceptance to the faculties:

1. 85% should have a two-year college degree. Of these, 60% should attend the higher schools and the 50% of these graduates should attend the faculties. The very basic aim here is to determine the students who are intelligent and very intelligent. Thus, 25% of the high school graduates can continue to attend the faculties. Based on this screening process, the students can pursue their education.

2. 20% of the high school graduates should attend two-year colleges, while 40% should attend higher schools, and the other 40% should go to the faculties. The transitions between them should also be easy.

Most of these students should enter the higher education and the faculties via the central examination. Thus, a good student profile is obtained at high schools. Later, these students should also be encouraged for graduate (M.A.) and doctoral (Ph.D.) studies.

#### 2.2.1. VOCATIONAL SCHOOLS OF HIGHER EDUCATION(2 Year, Rate 20%)

90% of the vocational schools of higher education colleges should include practice and applications in their programs. Opening these schools should be done in collaboration with the institutions in the industrial centers or the industrial sites. Starting from the second semester in the programs, internships should be carried out in the industrial institutions, including the summer. The government should also pay the insurance fees of these institutions and pay the students a certain amount of monthly subsistence. In short, the students should be encouraged. It will be enough for the instructors working at these schools to have M.A. degrees. The basic idea here is that the students should be equipped with practical knowledge and application. Therefore, the need for qualified personnel in the sector can be met in a shorter period of time.

#### 2.2.2. SCHOOLS OF HIGHER EDUCATION(4 Year Colleges, Rate 40%)

40% of the higher education includes schools of higher education. The difference between these schools and faculties is that at least 80% of the curriculum must include practice and application. It is enough to have a Ph.D. degree in order to work as instructors at these schools. For the first two years, the program

should be based on practice and application, while the rest of the two years should be based primarily on theoretical knowledge. The aim here is to educate and train qualified technical personnel that will follow the daily Technologies and find solutions to them. Most of these graduates should be trained as the staffs that will solve the technological problems. Moreover, educating and encouraging the graduates of these schools as entrepreneurs can also be a model for unemployment.

The students from this group can also complete their theoretical knowledge deficiencies by doing M.A. in their field. They should also graduate as the expert technologists by focusing more on the technology. There should be no difference from any other comparable master's degree.

**2.2.3. FACULTY(Rate 40%):**

The faculties are, in general, the institutions established to educate and train at the highest level in any area the human resources to become managers, R&D resources and lectures, and scientists. After their aim is determined, 60% of the programs should be based on practice and application, while 40% should include theoretical knowledge. As a result, not all of them will be theoreticians or the people that will do R&D activities. Therefore, the students should be trained considering the marked needs as well as the employees working in the related fields.

**2.3. LAYER 3L:**

The 3L layer generally represents graduate (M.A.) students. The total size of layers 1L, 2L and 3L represents 25% of the total number general of students. For this reason, it represents the future of countries and states. We regard this as the strategic population size of the layers 1L, 2L and 3L. Another meaning of this is that each of the four learners is better than the other three. This is the size of the scale in which countries need to invest and which need to be trained well. Therefore, 3L represents the student resource of the other 2L and 1L layers as well. There are two important graduate studies in Layer 3L.

In this layer, human resources should be trained in two ways. These are:

1. It is the group that provides the technical support for the sustainable use of the high technology that solves the day-to-day problems of the industry and the sustainable use of it, and at the same time develops the existing technology. The most important feature of this group is that it is the human resource that works more intensively in practical applications and is equipped with a master degree with theoretical technical knowledge at a sufficient level. This human resource is the source whose expertise is entirely the technology itself.

2. The other human resource for M.A. studies is the resource that graduated from the faculties. This resource covers all the disciplines that have departments in the undergraduate studies. For this reason, some segments can be classified into social fields, theoretical, practical, science, and health sciences. Similar arrangements can be made in other fields. This should have a changeable structure based on the priority needs of these countries.

**2.4. LAYER 2L:**

The Ph.D. layer 2L is the most important human resource that has a strategic importance for a country. For this reason, it cannot be replaced with any other variables. It is the people who will be in the center of the country in any situation. The size of this layer corresponds to 4,687% of the total population. The rate of students entering this level is 4,687%, while the graduation rate is about 3%. In other words, it is a source of human resources for every sector that a country needs. It is the human resource that can be the top manager of the public, private sector, small or large size enterprises. The proportions and rates can be seen in Figure 2.

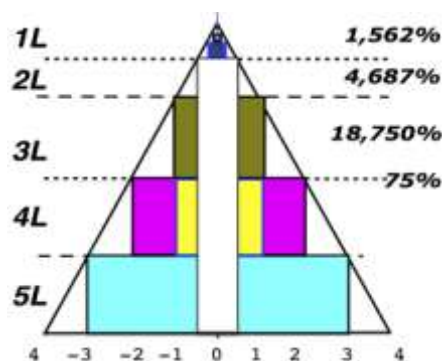


Fig.2 Potential human resources to be trained for the Ph.D. and post-doctorate.

The student resources to be admitted to this layer must be in two forms.

1. The students who have graduated from a faculty graduate source and completed their M.A. Degrees,
2. And the students with M.A. degrees, who studied in schools of higher education.

The students studying at these programs must be trained in private high-tech institutes or similar ones. All the projects to be conducted and the all the Ph.D. candidates should either focus on an innovation or find a radical solution to a very serious problem of the industry or find a new industrial commercial product. This should be the difference from other institutions of the similar level. . The main purpose here is to train qualified researchers.

### 2.5. LAYER 1L:

This is the layer where one fourth of the Ph.D. graduates are trained and educated for a very special purpose in accordance with the needs of the country as the scientists or R&D candidates or the top managerial candidates. This group also includes the one fourth of the group with the post-doctorate studies are the ones trained at the technologists, science planners, and the managers working in the institutions and organizations in the public and private sector. The size of this section has only the potential of 0,976/1000 ratio.

### 2.6. LAYER CENTER:

The group in the center represents the human resource with the average intelligence level in the country, and who has the population with the potential to be very intelligent. This is the group that the states should pay due attention. The potential size ratio of this group represents 3,98/1000 students. For this reason, it is crucial that this student group be selected from this crowded population with the least possible amount of faults.

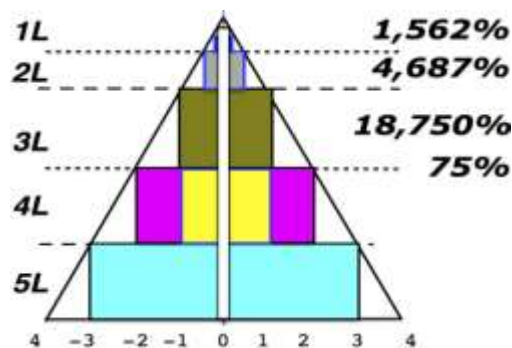


Fig.3 The potential human resource to be trained for post-doctoral studies.

### III. CONCLUSION

This study indicates that 25 % of the high-school graduates should be trained very well. There is a student potential of about 1/1000, which might be considered very good. Again, this model has candidates of 4,98/100.000 ratio, with the potential to be perfect or a genius. The main aim of this study is to pave the way for the great majority of the high school graduates to enter higher education and then to move on to higher levels based on the screening. Thus, it is also aimed to reduce the number of problems caused by inequality in education to a minimum and to clear the way for those with the potential to be super intelligent. These percentages are even more important for countries with fewer populations since it is proportionally more likely to find intelligent people than among large-scale countries. However, the loss of a very intelligent person in the less-populous countries is a great detriment. Therefore, states should take this issue seriously. The future of nations and the states depends on well-educated human resources at the size of the scale.

This model takes more than 35 years to reach the desired proportions of the system. In other words, a flexible model is suggested considering the needs to be born due to the development of countries. If these rates are to be reached much faster, the only thing to do is to bring the experts abroad into the country.

For the future, all the countries in the world should ask themselves the following questions. These;

1. How important is it whether the population is very large or very crowded?
2. How important is it when the geographical area of the country is large?
3. How important are to have the well-educated population at the size of scale?
4. How important is the population that produces critical high technology at the size of scale?
5. What should be ratio of the R&D population to the critical size of the scale?

The governors, authorities and organizations should correctly answer the above questions above for the future. These are crucial for their survival.

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