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ECONOMIC AND DEMOGRAPHIC IMPACTS ON THE PENSION INSURANCE SYSTEM IN THE REPUBLIC OF CROATIA - PROJECTIONS OF THE SUSTAINABILITY OF THE SYSTEM

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Abstract: *The pension system in the Republic of Croatia, whose stability directly depends on economic and demographic trends, faces long-standing challenges. The first forms of pension insurance in Croatia were based on informal forms of the so-called old-age insurance, while formal forms developed in the 19th century. After the crisis of the socialist period and the acquisition of independence, Croatia implemented a comprehensive pension reform in two phases. In the first phase, which began in 1999, the aim was to rationalize the existing intergenerational solidarity pension system and make it sustainable. After the first, in 2002, a second pension insurance reform was implemented, which constructed the second and third pension pillars and established capitalized pension savings.*

Despite the reforms implemented, the system still faces significant difficulties in its efficient functioning. This paper focuses on the development and analysis of scenarios for the development of the Croatian pension insurance system from 2021 to 2051, using available projections of demographic, administrative and economic indicators. The aim is to identify key variables important for the sustainability of the system, to identify advantages and disadvantages in its development and to propose specific measures and activities for further development of the system. The above recommendations aim to improve the economic and social effects of pension insurance and ensure its long-term sustainability. Various scientific methods were applied in the research, including analysis, comparison, induction, deduction, description and classification, as well as statistical and mathematical methods for detailed analysis of variables.

Keywords: *pension system, demographic and economic indicators, sustainability of the pension system, future development scenario, Republic of Croatia*

JEL classification: *H55, J11, J26*

INTRODUCTION

The pension system is an essential element of social security for every individual and society. According to (Puljiz, 2005) it represents „a set of legal norms, financial and institutional arrangements that regulate insurance against the risks of old age and disability." Therefore, its primary function is to ensure the financial and social security of an individual after the end of his working life or in the event of disability.

The way the pension system is financed directly affects the standard of living of pensioners and their financial and social security. Therefore, the level of rights that can be achieved in pension insurance directly depends on the sources of funds and financing possibilities. Since the pension system provides for the most significant social risks that can happen to everyone, the importance of its stability is of great importance for the population of a particular country (Vretenar Cobović & Cobović, 2016). In addition, this system is necessary for the balanced functioning of the entire society and the maintenance of social cohesion, i.e. the connection of individuals and groups within the social whole.

EVOLUTION AND IMPORTANCE OF PENSION SYSTEMS: A COMPREHENSIVE LITERATURE REVIEW

The beginnings of pension insurance in Croatia were based on informal forms of old-age insurance, whose carriers were agricultural household cooperatives. These cooperatives, the foundations of which were laid with the establishment of the Posavina Krajina in Slavonia in 1702, represented the first steps towards organized care for the elderly (Puljiz, 2008).

The government at the time allocated land to cooperatives with the obligation to perform military service. The influence of agriculture within these cooperatives was significant, and its basic function was the production of plant and livestock products to meet the nutritional needs of cooperative members, as well as daily financial assistance based on the income generated from sales.

The development of formal pension systems in our region became visible during the 19th century, primarily through pensions intended for soldiers and civil servants, and through the establishment of brotherhood funds. The legal regulation of the system followed in 1922 in Yugoslavia, with the adoption of the Workers' Insurance Act, which regulated workers' pension insurance (Puljiz, 2008). After World War II, other forms of social insurance were systematically introduced, with the gradual decentralization of the pension system. However, the crisis of the pension system, already present at the end of the socialist period, further deepened after Croatia gained independence and during the Homeland War. This situation prompted the necessity of reform, which began in the late 1990s and was completed in 2002.

Since the pension system reform implies partly replacing the intergenerational solidarity system with a funded system, it is important to determine under what circumstances a funded system brings a positive difference compared to the existing intergenerational system. Numerous authors critically analyze different models, highlighting their advantages and disadvantages.

(Jonhson, Conrad, & Thomson, 1989) emphasize that the goods and services consumed by retirees always come from the current production of the currently employed population, regardless of whether pensions are financed from taxes or indi-

vidual savings. (Brittan, 1996) complements this idea by arguing that workers pay taxes and contributions precisely to pay pensions and that all pensions are provided from current national income. (Blake, 1996) goes a step further, considering that all pension systems, whether funded or not, are inherently intergenerational, since each new generation works for the previous one. (Bohn, 2001) emphasizes the importance of distributing overall risks between the working population and retirees when designing pension reform. He believes that optimal pension policy should strive for a more even distribution of financial risks between generations. (Barr, 2002) emphasizes the key difference between risk and uncertainty in the pension system. While risk can be quantified, uncertainty, such as macroeconomic shocks, demographic changes or political instability, is not measurable. It also identifies three specific risks (management, investment and market risk) that threaten the stability of the system.

(Barr & Rutkowski, 2005) state the key prerequisites for the successful introduction of a mandatory funded system: a sufficiently developed financial market, adequate public and private administrative capacities with effective supervision, and the existence of a strategy for fiscally sustainable transition costs. (Jackson, 2009) highlight the macroeconomic advantages of a funded system, such as reducing the long-term fiscal burden of an aging population and encouraging adequate levels of savings and investment for the future.

On the other hand, (Diaz-Gimenez & Diaz-Saavedra, 2024) discuss the failure to adapt to long-term demographic trends as a key cause of the unsustainability of pensions in Europe, and analyze the financial and political costs of pension reforms. (Quinby & Wettstein, 2024) explore the possibilities for older workers to remain in the labor market for as long as possible, which is crucial for addressing the demographic challenges of pension systems. (Grujić & Vretenar Cobović, 2024) explore pension systems and individual fluctuations within the system with an emphasis on the pension system of Bosnia and Herzegovina. (Caloia, Mastrogiacomo, & Simonetti, 2025) deal with the interaction between household savings and shocks affecting the second pension pillar, which is important for understanding overall financial security.

Finally, (Kune, 2006) raises a fundamental question about viewing pension systems as mechanisms for transferring resources. Regardless of the model, the primary interest of both systems (intergenerational and funded) is how pension rights are secured, and only secondarily how they are financed.

However, due to the crisis of public pension systems, which are mainly based on intergenerational solidarity, Croatia has implemented significant reforms to adapt to the changed economic and social conditions. The causes of the crisis were multiple, and most often they were caused by the increased share of older people and the decline in the birth rate, which resulted in a generational imbalance. In addition to demographic changes, the crisis of the pension system in Croatia was also significantly influenced by increased unemployment and changes in the structure of work. This led to a reduced inflow of contributions from insured persons and a growing deficit in pension funds, which the state had to cover. Due to the difficult situation, in the mid-1990s, preparations for a pension reform began, in which the World Bank played a key role. It proposed a system that would transfer the burden of financing pensions to the insured, thereby reducing the pressure of pension funds on public finances (Puljiz, 2007).

The first phase of the pension reform began in early 1999. Its aim was to ratio-

nalize and ensure the sustainability of the existing intergenerational solidarity pension system. The so-called parametric pension reform was implemented, in accordance with the 1998 Pension Insurance Act, whereby Croatia sought to reduce pension costs and adjust them to economic opportunities. These changes quickly contributed to better financial sustainability of the system. However, despite positive trends, the parametric reform also resulted in a relative decline in pensions for retired insured persons after 1999, which required further reforms.

The second phase of the pension reform was implemented in 2002. It created the second and third pension pillars and established a system of defined contributions and capitalized pension savings. The goal of this phase was to increase domestic savings, strengthen the capital market and stimulate overall economic growth. This reform brought about a significant change in the structure of the pension system, the solutions of which are still applied today.

In accordance with the implemented reforms, the current pension system in Croatia is based on a mixed financing model, with several pension pillars. The first pillar is mandatory pension insurance based on intergenerational solidarity, and is financed by contributions from insured persons, which employers pay at a rate of 20% of the employee's gross salary. Pension insurance within the second pillar is mandatory for insured persons who are insured under the Pension Insurance Act, and the holders of this insurance are mandatory pension funds. The contribution rate paid into mandatory pension funds is 5% of the insured person's gross salary. Accordingly, insured persons who were younger than 40 years of age in 2002 and are insured in both pillars of pension insurance, allocate 15% of contributions for the first pillar and 5% of contributions for the second pillar of pension insurance. The third pillar is voluntary pension insurance based on individual capitalized savings, intended for those who want to additionally insure themselves against the risks of old age, disability and death.

Despite the reforms implemented, the current pension insurance system in Croatia continues to face significant difficulties that hinder its effective functioning. In line with previous research, the aim of this paper is to present a scenario for the development of pension insurance in Croatia in the period from 2021 to 2051, based on available projections of the development of demographic, administrative and economic indicators. Within the framework of the developed scenario, the trends of individual pension insurance variables important for the sustainability of the entire system will be analyzed.

RESEARCH METHODOLOGY

In accordance with the research subject and the set objectives, the work is based on the following research hypotheses:

H1 Growth in the employment rate and real gross wage positively correlates with improved fiscal sustainability of the pension system based on intergenerational solidarity in the Republic of Croatia, while positive real returns of pension funds significantly contribute to the financial sustainability of funded pension pillars

H2 Existing negative trends in key demographic and economic variables in the pension insurance system of the Republic of Croatia indicate the need for the implementation of additional reform measures and/or the development of alternative financing models in order to ensure the long-term sustainability and adequacy of pension rights.

When creating the future scenario for the development of pension insurance in Croatia, projections of demographic, administrative and economic trends prepared by competent international and domestic institutions (World Bank, Central Bureau of Statistics of the Republic of Croatia, Ministry of Finance of the Republic of Croatia, Croatian Chamber of Economy, etc.) were used. Projections of demographic trends are key for formulating macroeconomic policies of each country. They determine the current and future social and socio-economic development through the analysis of the number and composition of the population according to various demographic and economic characteristics. In Croatia, demographic aging (growth in the share of the population older than 65 years) has been the dominant demographic trend in recent decades. This trend will have an adverse effect on the future of the pension system, which is extremely dependent on demographic indicators.

Projections of the total population in Croatia are shown in Table 1.

Table 1: Population of Croatia by age group

Year	Population by age (in thousands)				Population by age (in %)			
	Total	0-14	15-64	65 and over	Total	0-14	15-64	65 and over
2021	3,871.8	552.5	2,450.1	869.2	100	14.27	63.28	22.45
2031	3,666.7	429.0	2,354.0	883.7	100	11.7	64.2	24.1
2041	3,477.8	369.1	2,167.8	940.9	100	10.6	62.3	27.1
2051	3,123.1	310.2	1,832.8	980.1	100	9.9	58.7	31.4

Source: Central Bureau of Statistics of the Republic of Croatia (https://dzs.gov.hr/), Eurostat (http://ec.europa.eu/eurostat)

The development of the pension system of the Republic of Croatia in the next 26 years will be significantly affected by the decrease in the total population, especially the decrease in the population aged 0 to 14 and 15 to 64, and the increase in the pensioner population, specifically the population aged 65 and over.

Within the framework of administrative projections, an important strategic document published by the European Commission in 2012 (White paper, An Agenda for Adequate, Safe and Sustainable Pension, 2012), which encourages EU member states to constantly increase the legal retirement age, is important. Based on this document, this age limit should be increased by five to seven years by 2060, due to the expected increase in human life expectancy.

Within the framework of economic developments, according to projections by the World Bank, the Ministry of Finance of the Republic of Croatia and the Croatian Chamber of Economy, a revival of economic activity is expected in the next twenty to thirty years, both in Europe and in Croatia. In the coming years, an annual real growth rate of gross wages of up to 3% is expected (World Bank (www.worldbank.org/en/country/croatia), (https://www.worldbank.org/en/country/croatia/overview), (chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://thedocs.worldbank.org/en/doc/d5f32ef28464d01f195827b7e020a3e8-0500022021/related/mpo-hrv.pdf); Croatian Chamber of Economy (https://www.hgk.hr/).

The real growth rate of gross wages will grow somewhat slower than the growth of gross domestic product, or productivity, and after a certain time, wage growth should move in line with GDP growth, whose annual real growth rate is also expected to range up to 3%. In addition, it is possible to expect real annual returns from mandatory pension funds of 3% to 4%, and real returns from voluntary pension funds of up to 1.5%, which will certainly have a positive effect on the overall level of pensions (Economic and Fiscal Policy Guidelines, 2021).

In order to present a scenario of the movement of the most important variables of the sustainability of the pension insurance system in Croatia from 2021 to 2051, it is necessary to define the starting assumptions. In accordance with the aforementioned projections, the demographic assumptions of the pension insurance development scenario are as follows:

1) The total population of Croatia in 2021 is 3,871,833 inhabitants. The population structure by age group is as follows (0 - 14 years 14.27%; 15 - 64 years 63.28%; 65 years and over 22.45%).

2) The total population of Croatia in 2051 is 3,123,155. The population structure by age group in 2051 is as follows (0 - 14 years 9.9%; 15 - 64 years 58.7%; 65 years and over 31.4%).

3) Life expectancy increases by two years every ten years within the observed period (White paper, An Agenda for Adequate, Safe and Sustainable Pension, 2012)

The administrative assumptions of the pension insurance development scenario are:

1) The retirement age will be increased to 72 years in 2051. In the period from 2021 to 2051, the retirement age will be increased by one year every 6 years.

2) All other pension regulations valid in 2021 apply until the end of the observed period.

The economic assumptions of the pension insurance development scenario are:

1) In the period from 2021 to 2051, the real growth rate of gross wages is 3% per year.

2) In the period from 2021 to 2051, real GDP growth is 3% per year.

3) The percentage of the employed population aged 15 to 64 (the share of employed persons in the working-age population) gradually increases from 41.33% in 2021 to 46.55% in 2031. From 2031, the percentage of the employed population gradually decreases to 42.94% in 2051, in line with economic trends forecasts (World Bank, Croatian Chamber of Commerce).

4) In the period from 2021 to 2031, the real return of mandatory pension funds is 3% per year, and after 2031, 4% per year, while the real annual return of voluntary pension funds in the period from 2021 to 2051 is 1.5%.

The following mathematical formulas were used to calculate pension insurance variables important for its sustainability:

Working age population = population aged 15-64 + working age population aged 65 and over (1)

The calculation of the working-age population is obtained by adding a certain percentage of the population aged 65 and over to the number of the population aged 15 to 64, because according to administrative assumptions, the age limit for retirement

increases by one year every 6 years in the period from 2021 to 2051. Based on this, the number of inhabitants aged 65 and over actually becomes the population aged 15 to 64 according to administrative assumptions, i.e. the working-age population.

Working age population = working age population x 0.61 (2)

The calculation of the working population was obtained based on the assumption that 61% of the working-age population is the working-age population. This percentage was accepted as an assumption based on the ratio of the working-age population to the working-age population in the period from 2010 to 2021. In this period, based on data from the Central Bureau of Statistics of the Republic of Croatia, the average share of the working-age population in relation to the working-age population was 61%.

Number of insured persons = working population x employment rate (3)

Number of pensioners = number of insured persons x (ratio of number of pensioners to insured persons based on previous years) x (% change in population growth of 65 and over compared to the previous year) x (% change in working-age population aged 65 and over conditioned by administrative assumption) (4)

Amount of monthly pension from the first pension pillar = (annual amount of contributions paid / number of pensioners) / 12 (5)

Amount of monthly pension from the 2nd pension pillar = (annual amount of contributions paid increased by the realized yield of MPFs / number of pensioners) / 12 (6)

Total annual payment in the first pillar = annual payment of pension contributions x total number of insured persons (7)

Pension fund assets = MPF assets of the previous year + total annual payment of pension contributions to the funds increased by the realized yield of MPFs – expenses for second-pillar pensions (8)

Pension insurance company assets = PIC assets of the previous year + expenses for second pillar pensions (9)

RESEARCH RESULTS AND DISCUSSION

As a result of the research, the following is a scenario of the movement of the most important variables of the sustainability of the pension insurance system in Croatia from 2021 to 2051.

Table 2 shows the working-age and active population, as well as the number of insured persons and pensioners calculated based on pre-set assumptions.

Table 2: Number of insured persons and pensioners (in thousands)

Year	Working age population	Working active population	Number of insured persons	Number of pensioners	Ratio insured persons / pensioners
2021	3,279	1,712	1,572	1,233	1.27
2031	2,996	1,695	1,591	1,379	**1.15**
2041	2,809	1,666	1,632	1,455	**1.12**
2051	2,895	1,729	1,532	1,322	**1.16**

Source: author's calculation

Unlike the number of working-age and active population (which will decline until 2041), the number of insured persons will gradually increase until 2041. After 2041, due to the retirement of people born before 1970 and the entry into the labor force of a smaller population aged 15 to 64, in accordance with demographic assumptions, the number of employees and the number of insured persons will decrease. It is assumed that the trend of decreasing the number of insured persons will continue after 2051, but with a lower intensity of the decrease. Similar trends are expected for the future number of pensioners in the Croatian pension system, in accordance with the assumptions of the pension insurance development scenario. After 2021, the number of pensioners will increase significantly due to the fulfillment of the conditions for old-age pension by the larger generations born in the 1950s and 1960s. This trend will continue until 2041, after which the number of new retirees will decrease, as fewer generations born in the 1970s will retire. It is assumed that the downward trend will continue after 2051.

Based on the above, it can be concluded that the number of pensioners will increase over the next twenty years, but at a lower intensity than in the previous period. Accordingly, if the economic trends assumed in the pension insurance development scenario are achieved in the coming period, the sustainability of the pension insurance system is not in question, although the ratio of insured persons to pensioners in the period from 2021 to 2041 will have downward trends despite the growth of economic activity. After 2051, this ratio will be somewhat more favorable.

Table 3 shows the future amount of monthly pension in both insurance pillars.

Table 3: Amount of monthly pension (in euros)

Year	Pension amount from the first pillar	Pension amount from the second pillar	Total
2021	395	91	486
2031	523	**165**	688
2041	711	**298**	1,009
2051	**667**	**432**	1,099

Source: author's calculation

For insured persons insured within both insurance pillars, pensions from the first part for each subsequent generation will depend less and less on the level of the insured person's salary, and solidarity and redistribution from insured persons with higher salaries to insured persons with lower salaries will be increasingly pronounced. According

to the calculation shown in the table, pensions from the first pillar will decrease after 2041, while in accordance with the projected growth in salaries and the growth in the real yield of pension funds, pensions from the second pillar will have a constant growth. Their growth intensity will not be great, but it is expected that pensions from the first and second pillars of insurance will be equalized by 2060, or more precisely, it is possible to expect higher pensions realized within the second pillar of insurance (capitalized savings) compared to pensions realized within the first pillar of insurance (intergenerational solidarity).

Table 4 shows the future amounts of total annual contributions paid within the three pillars of pension insurance.

Table 4: Amount of total annual contributions paid within the three pillars of pension insurance (in millions of euros)

Year	I pillar (total annual payment in million euros)	2nd pillar (total annual payment in million euros)	III pillar (total annual payment in million euros)
2021	3,352	993	84
2031	3,930	**1,320**	**119**
2041	4,876	**1,984**	**236**
2051	**3,606**	**2,372**	**261**

Source: author's calculation

Based on the defined demographic, administrative and economic assumptions within the pension insurance development scenario, and especially due to the increase in the employment rate and the growth of gross wages, it is possible to expect a trend of growth in the amount of total contributions paid into the second and third pillars of insurance, throughout the entire observed period. Although the intensity of this growth, as with the growth of pensions, is not great, growth can be expected after 2051.

Contributions paid into the first pillar of pension insurance will increase until 2041, after which they will record a downward trend due to the reduced number of insured persons. The downward trend in contributions paid into the first pillar of pension insurance will continue after 2051.

Table 5 shows the future value of the assets of mandatory pension funds and pension insurance company assets in the Republic of Croatia.

Table 5: Assets of mandatory pension funds and pension insurance companies (in millions of euros)

Year	Gross domestic product	Pension fund assets	Share in GDP (%)	Assets of pension insurance companies	Share in GDP (%)
2021	58,466	17,676	30.23	321	0.55
2031	99,534	**33,191**	33.35	**4,081**	4.10
2041	179,770	**47,348**	26.33	**12,191**	6.78
2051	324,685	**64,489**	19.86	**28,993**	8.93

Source: author's calculation

The assets of mandatory pension funds in Croatia will have a constant growth trend based on the increase in paid contributions, real wage increases and the expected real returns from investing the funds' assets. The value of the assets of mandatory pension funds will have a higher growth intensity until 2041, after which the growth rate of the assets of these funds will be lower, because an increasing number of second-pillar insured persons will exercise the right to a pension and their pension savings will be transferred from pension funds to pension insurance companies that will pay pensions. Accordingly, in the period after 2041, the assets of pension insurance companies will grow significantly.

Based on the presented scenario for the development of the pension insurance system in the Republic of Croatia in the period from 2021 to 2051, based on the set demographic, administrative and economic assumptions, it is possible to draw certain conclusions. The analyzed variables of the sustainability of the pension insurance system (future number of insured persons, number of retirees, amount of pension, pension contributions and assets of pension funds) show mainly positive trends within the capitalized second and third pillars of pension insurance, which makes it possible to expect the sustainability of this system within the observed period. By ranking these indicators, it is possible to see that the employment rate and the real gross wage rate significantly affect trends in this system, while the capitalized pension pillars are additionally affected by the real returns of pension funds. The employment rate and the growth of the real gross wage rate affect contributions in all three pillars of insurance, while the increase in the returns of mandatory pension funds also affects the assets of the funds themselves.

Based on the above, it is possible to confirm the research hypothesis H1, since the growth of the employment rate and real gross wage positively correlates with the improvement of the fiscal sustainability of the pension system based on intergenerational solidarity in the Republic of Croatia, while positive real returns of pension funds significantly contribute to the financial sustainability of funded pension pillars.

If the set demographic, administrative and economic assumptions are realized, the growth in the number of insured persons, the growth in the expected amount of paid contributions, the growth in pensions and the growth in pension fund assets within the second pillar of insurance will certainly result in the sustainability of capitalized savings and its greater impact on the entire system compared to the first pillar of pension insurance, which shows negative trends in certain researched variables. In addition, the expected increase in the number of insured persons and paid contributions within the third (voluntary pillar of insurance) will increase the long-term sustainability of this system and create additional security for future retirees. Accordingly, it is possible to confirm the second research hypothesis H2, because the existing negative trends in key demographic and economic variables in the pension insurance system of the Republic of Croatia indicate the need for the implementation of additional reform measures and/or the development of alternative financing models in order to ensure the long-term sustainability and adequacy of pension rights.

CONCLUSION

The stability and sustainability of the pension system represent one of the most serious socio-economic challenges facing the Republic of Croatia. The analysis of the

pension insurance development scenario for the period from 2021 to 2051, based on key demographic, administrative and economic indicators, reveals a complex picture with positive and negative trends in key variables. The most obvious and worrying finding is that adverse demographic trends will have a dominant impact on the future of the pension system. Even with the assumed growth in economic activity, the reduction in the working population after 2041 will lead to a decline in the number of insured persons. This will consequently result in lower contribution payments and, more importantly, lower pensions than expected, especially within the first pillar of mandatory pension insurance.

It is important to emphasize that there were certain methodological limitations in this research. The main challenge lay in the inconsistency and diversity of data on the number of pensioners, average pensions and contributions to the first and second pension pillars, available from various official sources such as the Croatian Pension Insurance Institute (CPII), the Central Register of Insured Persons (CRIP) and the Central Bureau of Statistics (CBS). This inconsistency significantly hindered precise calculations within the developed pension system scenario, highlighting the need for better coordination and standardization of data collection among relevant institutions.

In order to at least partially mitigate the negative trends identified in the presented scenario, it is necessary to upgrade the existing models and develop a new, comprehensive model of financing the pension system. Positive developments in variables within the second and third pillars of pension insurance, assuming economic growth, clearly indicate the need for further stimulation of these forms of savings. However, in addition to economic factors, it is crucial to take into account the influence of non-economic factors, primarily the attitudes and trust of stakeholders in the system. The insufficient presence of investments in voluntary pension funds in the Republic of Croatia is a clear indicator of the lack of trust and awareness, which requires more active measures to stimulate financial literacy and long-term savings.

The development of innovative savings models is crucial for additional collection of pension contributions, optimization of the amount and duration of pension fund payments, and ensuring successful management of pension fund assets. Ultimately, all this should lead to greater user trust in the entire pension system. These proposals represent a good basis for future research that can significantly contribute to the development of a more resilient and fairer pension system in the Republic of Croatia. The goal should be to create a model that enables greater fairness with regard to the invested funds in relation to the final realized pension amount after legally acquired retirement conditions, which also ensures a more balanced development of the entire society.

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