Necessity of labour market state's regulation

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Abstract. The purpose of this article is to justify the necessity for state regulation of the labour market. Various options for setting wages at the state level, trade unions and employers are considered. It is shown the expediency of state regulation of the labour market in order to ensure the optimal level of employment. It has been established that the maximum tax base and the highest level of employment are achieved simultaneously, with the same optimal level of remuneration. None of these goals can be achieved separately from the other.

1 Introduction

Unemployment is one of the most acute social and economic problems. A high level of unemployment indicates a low level of supply of goods, because when the amount of capital and are specified, production depends on the amount of labour resources used. At the same time, excessive unemployment is the cause of the low level of consumer demand, which also leads to the formation of disproportions in the economy. The minimum unemployment is one of the criteria of a developed economy, therefore, the problem of studying the characteristics of the labour market and the formation of wages is very relevant.

The article [1] shows the rising relevance of the institutional theories for the labour market economics. The paper [2] develops a New Keynesian model with labour search and investigates the effects of product and labour market regulation on macroeconomic outcomes. The paper [3] explores the influence of labour market institutions on aggregate fluctuations. The article [4] reviews concepts and theories regarding economic balance in incidence with the labour market. In paper [5] is estimated a dynamic stochastic search-matching model with heterogeneous workers and aggregate productivity shocks. In [6] is found that workers respond to declining macroeconomic conditions by increasing work effort. In the paper [7] labour market institutions and policies are shown to affect the labour income share. In the article [8] author examines the effect of employment protection rules on labour productivity. The paper [9] analyses possible relations between Employment protection legislation, real GDP growth and wage share. The paper [10] studies the macroeconomic impact of a statutory minimum wage. The paper [11] investigates the relationship between political instability and labour market institutions. In the article [12] the effects of labour market reforms are studied in an innovation-driven model of endogenous growth with a heterogeneous labour force, labour market rigidities, and structural unemployment. In the article [13] is created structural vector autoregressive error correction model for labour productivity, employment, unemployment rate and real wages. The paper [14] uses individual-level data to estimate the labour market consequences of environmental policies. In the paper [15] a theoretical model to investigate the relation between corruption and labour supply is developed. The paper [16] proposes a novel approach to identify structural long-term driving forces of the labour market and their short-run state-dependent effects. The paper [17] has found a negative relation between long-run economic growth and unemployment. In the article [18] authors introduce wage inertia in the neoclassical one sector growth model. In the paper [19] is shown that a standard flexible price model with labour market frictions that allows hiring costs to depend on technology shocks may also lead to the same negative impact on labour inputs. The paper [20] examines the effect of minimum wage increases on hours of work and employment. The paper [21] analyses the evolution of the elasticity of labour demand and the possible role of offshoring therein. The paper [22] studies a labour market with search and matching frictions, and a monopoly union. The paper [23] explores uncertainty shocks as a driving force in a search and matching model of the labour market. The article [24] study a model where households are subject to uninsurable unemployment risk, price setting is subject to nominal rigidities, and the labour market is characterized by matching frictions and inflexible wages. Authors of the paper [25] develop a new Keynesian model with unemployment and endogenous participation. The article [26] proposes a model with an endogenous labour force and compare with the model with an exogenous labour force.

A well-developed market economy does not mean any kind of "absolute freedom" and "free play" of economic forces, directed by the "invisible hand" of self-

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regulated competition. For modern conditions, interweaving of market with state regulation methods and their combination in many spheres of economy is characteristic. So the labour market faces the opposite interests of employers and workers or firms and households. It is the state that can treat these antagonistic macroeconomic agents as a whole, as a single system of employers-workers and develop optimal solutions for their interaction, provide recommendations and regulate their activities. After all, it is the state that is interested in the fact that the individual results of the activities of firms and households accumulate in the maximum value of national income and employment.

Thus, the purpose of this article is to justify the necessity for state regulation of the labour market.

2 Results

The labour market, based on the results of the interaction of supply and demand, establishes the level of employment, which affects the supply of goods, the national income, and the effective households demand. In case of exceeding the supply of labour on demand, unemployment is created, which has not only economic but also social and political consequences. This shows the multifaceted nature of this problem. The state receives direct taxes on the income of households and firms in order to replenish the budget and perform its functions. This indicates the state's interest in ensuring that the profits of the employer-worker system (firms-households) are maximized but not fundamentally, exactly how these profits are distributed among the participants of the system, in case of equal rate of tax on the profits of employers or workers. At the same time, one of the functions of the state is the redistribution of income and the provision of social assistance to the unemployed. Thus, the state itself should aim to achieve optimal interaction between households and firms, minimum unemployment and maximum production. So, let's consider from the point of view of the state, the purpose of which is to obtain the maximum tax revenues to the budget from the total income of employers-workers, the functioning of this system.

For firms, the rest of the production factors, in addition to labour resources (fixed assets, circulating assets), do not have their economic interests, therefore, it can only be talked about their optimal use. Another parameter of optimization – the quantity of labour resources, has its own characteristics. On the one hand, the wages of workers are costs that increase the price of goods and services, and, on the other hand, wages are an incentive to work, that can motivate workers to increase their productivity, skills development and the use of talent, and thus to achieve greater profits by firms. In addition, it is human resources that are the driving force of progress, since no other production factor has such a unique characteristic as the mind and the ability to think and improve the environment. At the national economy's level, households' solvent demand affects the level of sales of goods of firms, and household saving is a source of realization of investment demand of firms.

Regarding the labour force, its owners should be considered as independent economic entities with their own interests. Therefore, it is necessary to define certain equilibrium conditions in the relations between employers (firms) and workers (households).

First, let's consider optimizing the profits of firms with the exception of wages (Fig. 1). The function $F(L)$ is increasing, but it is slower and concave (convex upward), because for the implementation of additional volumes of products and services in the market it is necessary to gradually reduce prices, attract more expensive resources, time, etc.

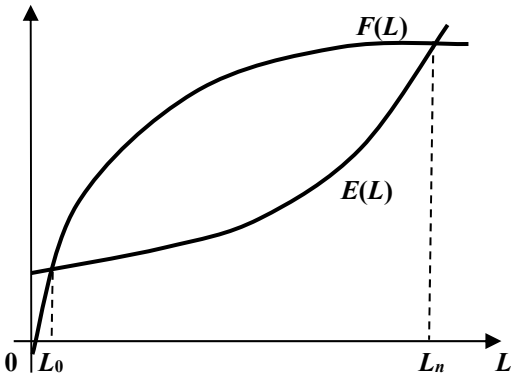

Fig. 1. Definition of break-even points of firms and households.

Then let's consider the workers (households) with the increasing convex down function of the expenses of $E(L)$ to provide the amount of labour in volume L, since, in addition to the restoration of physical and emotional forces, workers need to get education, train mental and professional abilities, improve their qualifications, etc.

By virtue of these significant nonlinearities, there are two points of break-evenness L_0 and L_n (points of intersection of the curves $F(L)$ and $E(L)$) in Fig. 1. Such situation is in contrast to the standard linear case, where such a break-even point is one and the task is only to find it because the more L the better it seems to be.

In fact, such an unlimited increase in profits is unrealistic, in addition to the left-hand side of the break-even, there will always be rights, and the truth, the maximum profit will be located somewhere in the middle. Therefore, it is inappropriate to restrict the analysis to the definition of the break-even point only; the optimum point should also be found.

From the standpoint of firms in general, should maximize total profits

$$P(L) = F(L) - E(L) \to \max_{L} \qquad (1)$$

The maximum profit $P=AC$ (Fig. 2) of firms can be distributed among employers and workers as $P_1=AB$ and $P_2=BC$. The state also fulfills the goal and receives the maximum amount of tax revenues to the budget from the total income of employers and workers, namely, the rate as a percentage of $P_1=AB$ as taxes on employers and percent of $P_2=BC$ as taxes on workers.

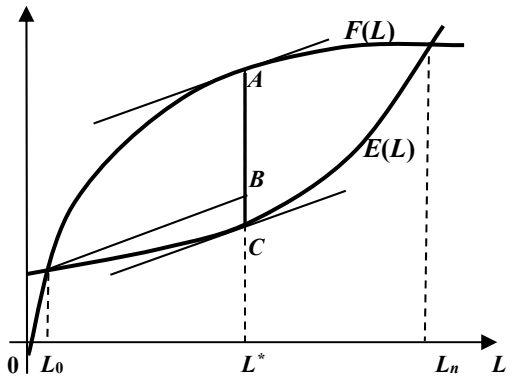

Fig. 2. Optimization of the wage rate from the point of view of the state and determination of the optimal amount of employment.

Such a distribution of profit will correspond to the equilibrium of firms, when state regulation sets the wage rate for the production of a product unit W at the level $F'(L^*)=E'(L^*)$ and consider employers and workers as economically independent entities.

Then the functions $F(L)$ and $E(L)$ belong not to one, but to different economic entities. The interaction of the participants in the economic system of the household-firm is carried out through the wage rate W (which determines in Fig. 2 the angle of inclination of the tangent to the curves).

So, when $W^*=F'(L^*)=E'(L^*)$ firms solve their independent task:

$$F(M) - W^* \cdot M \to \max_{M \geq 0}, \tag{2}$$

and households solve their independent task:

$$W^* \cdot L - E(L) \to \max_{L \geq 0}, \tag{3}$$

and results coincide:

$$M^*(W^*)=L^*(W^*). \tag{4}$$

Namely, what amount of labour resources will be most advantageous for firms, it is this amount that is most advantageous to provide to households. Thus, in the state of equilibrium, the condition of optimality of the whole system is fulfilled.

It is clear that at any other wage rates $W \neq W^*$ the amount of attracted labour can only decrease in compare to the equilibrium (and optimally from the point of view of the system as a whole) $L^*(W^*)=M^*(W^*)$, since it is defined as $\min\{L^*(W^*), M^*(W^*)\}$ and a "bottleneck" will be created either because of a lack of demand at $L^*(W^*)>M^*(W^*)$ (when the wage rate is overvalued compared to W^*), or because of the lack of an offer for $L^*(W)<M(W^*)$ (at a wage rate lower than W^*).

Thus, in determining the level of remuneration by the methods of state regulation in the amount of W^*, not only maximization of tax revenues is achieved, but, at the same time, the condition for maximizing the profit of the whole system is fulfilled and the optimal level of employment is achieved.

The functioning of the modern labour market is characterized by the presence of trade unions, which affect the level of wages and working conditions of workers. The historical experience of the existence of trade unions proved their effectiveness and the necessity of existence as an organ representing the interests of workers. At the same time, there are negative consequences of trade unions, whose goal is to fight for the best conditions for those who work, but not for those who are unemployed. On the contrary, due to long-term labour contracts, high salaries, which are fought by trade unions, create so-called forced unemployment. That is, the task of the trade unions is to defend the interests of not all households, but only of workers, they are not interested in employment, but wages.

Consider the case where the wage rate is not set by the state or firms, but by the trade unions, based on the interests of the cumulative worker:

$$P_2(L,W) = W \cdot L - E(L) \to \max_{L,W \geq 0}, \quad L \leq M^*(W). \tag{5}$$

The condition $L \leq M^*(W)$ makes the problem non-trivial; otherwise, it would be possible to infinitely increase the wage rate W, the amount of labour attraction and, accordingly, its share of profit $P_2(L, W)$. By virtue of this condition, the volume of labour should not exceed the amount of demand for it, which decreases with the increase of the wage rate, and for its expansion it is necessary to lower the rate (but then the attractiveness of labour will decrease). Thus, a joint optimization of the values of these parameters is required – wage rates and the amount of labour resources used.

According to Fig. 3, the profit of the workers is

$$P_2 = B_2C_2 = B_2G_2 - C_2G_2 . \tag{6}$$

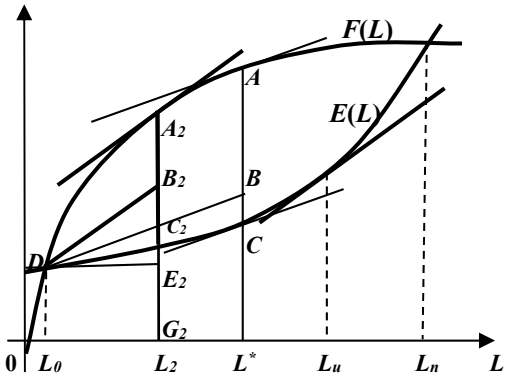

Fig. 3. Optimization of wage rates from the point of view of trade unions (aggregate worker).

Because $B_2G_2 = B_2E_2 + E_2G_2$,

$$B_2E_2 = DE_2 \cdot tg(\angle B_2DE_2) = (L_2 - L_0) \cdot F'(L_2) , \tag{7}$$

$E_2G_2 = E(L_0)$, $C_2G_2 = E(L_2)$, then

$$P_2 = (L_2 - L_0) \cdot F'(L_2) + E(L_0) - E(L_2) \to \max_{L_2} . \tag{8}$$

Hence the necessary condition for extreme:

$$dP_2 / dL_2 = F'(L_2) + (L_2 - L_0) \cdot F''(L_2) - E'(L_2) = 0 \text{ , (9)}$$

$$E'(L_2) = F'(L_2) + (L_2 - L_0) \cdot F''(L_2) . \quad (10)$$

Since $L_2–L_0>0$ and $F''(L_2)<0$, $E'(L_2) < F'(L_2)$, that is $L_2 < L^*$, because $E'(L^*) = F'(L^*)$.

Second derivative

$$d^2P_2 /(dL_2)^2 = 2F''(L_2) + (L_2 - L_0) \cdot F'''(L_2) - E''(L_2) . \quad (11)$$

Here, $F''(L_2)<0$, $-E''(L_2) < 0$, $F'(L_2) < 0$, $–E'(L_2) < 0$, $L_2–L_0>0$, that is, if $F'''(L_2)<0$, the second derivative is negative and with the employment L_2 and wage rate $W=F'(L_2)$ maximizes the income of workers. In comparison with the equilibrium W^*, the wage rate is optimal from the point of view of the worker, the corresponding increase (and theoretically the most favorable at this rate) is the increase in the amount of labour attraction *Lu*, but the use of labour resources L_2, on the contrary, decreases even compared with L^* (not to mention *Lu*) because of the reduction in demand in the context of the increased use of labour by firms.

The total profit of the system thus decreases ($A_2C_2<AC$), but the income of workers is increasing as much as possible ($B_2C_2>BC$). Note that even when the establishment of the wage rate is the prerogative of trade unions (not the state and not employer-firms), this rate does not increase infinitely, but determined by its optimum value, taking into account labour demand.

However, when $F'''(L_2)>0$ it is possible that the second derivative at point L_2 is positive, that is, the amount of the employment income of workers will reach not the maximum, but the minimum. This situation will be due to the high elasticity of the function $F(L)$, even if the insignificant growth of the wage bill significantly affects the employability of firms.

Thus, the overestimation of wage rates by trade unions leads to unemployment (in the amount of $L^*–L_2$, which can lead to an increase in the rate of natural unemployment), increase in prices and decrease in production and services, reduce of tax revenues (at a rate in percentage of the difference between the $AC–A_2C_2$) and the increase in budget expenditures for social assistance to the unemployed, which leads to a budget deficit.

Unprofitable and lowering of wage rates than W^*, as then the total profit of firms and the share of workers in its distribution will decrease.

Consider now the case where the wage rate is set not by the state and not by trade unions, but by employers-firms, based on the interests of their own profits:

$$P_1(M,W) = F(M) - W \cdot M \to \max_{M,W \geq 0}, \quad 0 \leq M \leq L^*(W). \quad (12)$$

Here the condition $M \leq L^*(W)$ makes the problem non-trivial; otherwise it would be possible to reduce the wage rate W to zero, unlimited increase in the demand for labour resources M and, accordingly, profit $P_1(M. W)$. By virtue of this condition, the demand should not exceed the possible supply of labour, which is reduced with the reduction of the wage rate. Thus, a joint optimization of the values of these parameters is required – wage rates and the amount of employment of labour resources.

According to Fig. 4 (for the unity of designations we will switch for employers to the variable L), the employer's profit is

$$P_1 = A_1B_1 = A_1G_1 - B_1G_1 \quad (13)$$

Since $A_1G_1 = F(L_1)$, $B_1G_1 = B_1E_1 + E_1G_1$,
$B_1E_1 = DE_1 \cdot tg(\angle B_1DE_1) = (L_1 - L_0) \cdot E'(L_1)$,
$E_1G_1 = F(L_0)$, then

$$P_1 = F(L_1) - (L_1 - L_0) \cdot E'(L_1) - F(L_0) \to \max_{L_1} . \quad (14)$$

Hence the necessary condition for extreme:

$$dP_1 / dL_1 = F'(L_1) - (L_1 - L_0) \cdot E''(L_1) - E'(L_1) = 0, \text{ (15)}$$

$$F'(L_1) = (L_1 - L_0) \cdot E''(L_1) + E'(L_1) . \quad (16)$$

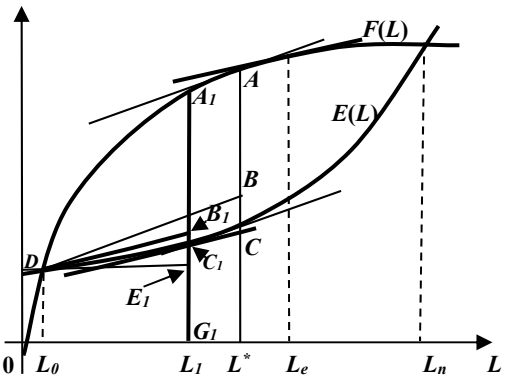

Fig. 4. Optimization of wage rates from the point of view of employers.

Since $L_1–L_0>0$ and $E''(L_1)>0$, $F'(L_1) > E'(L_1)$, that is $L_1 < L^*$, because $E'(L^*) > F'(L^*)$.

The second derivative is

$$d^2P_1 /(dL_1)^2 = F''(L_1) - (L_1 - L_0) \cdot E'''(L_1) - 2E''(L_1). \quad (17)$$

Here $F''(L_1)<0$, $L_1–L_0>0$, $E''(L_1)>0$, and if $E'''(L_1)>0$, then the second derivative is negative and at the level of employment L_1 and the wage rate $W = E'(L_1)$ the maximum profit of employers is reached.

Compared to the equilibrium W^*, the wage rate optimal from the point of view of firms decreases, desirable (theoretically the most favorable at this rate) demand for labour L_e increases, but the volume of supply L_1 decreases even compared with L^* (even say nothing of L_e) due to the reduction of the attractiveness of work among the workers.

At the same time, the aggregate profit of the system is decreasing ($A_1C_1<AC$), tax revenues in the state

budget are reduced, but employers' income grows as much as possible ($A_1B_1<AB$). Note that even if the establishment of the wage rate is the prerogative of employers (not state and non-trade unions), this rate does not go down to zero, it determines its optimal value, taking into account the interests of workers. But nevertheless, for such a monopoly, the wage rate is reduced compared with the equilibrium (and optimally from the point of view of the system as a whole) value, and the level of employment falls (unemployment is the difference $L^*–L_1$).

However, when $E'''(L_1)<0$ it is possible that the second derivative at point L_1 is positive, that is, for such a volume of production the profit of the employer will reach not the maximum, but the minimum. This situation will be due to the high elasticity of the function $E(L)$, even if a slight reduction in the wage rate significantly affects the amount of labour supply from the point of view of the workers.

So, under the condition of the positivity of the second derivative of the function $P_1(L)$ at the point L_1, the equilibrium (W^*, L^*) is stable on the part of employers; from this state it becomes disadvantageous to reject even if it is possible to establish not only the volume of output itself but also the rate wages.

Thus, depending on the features of the functions $F(L)$ and $E(L)$, in particular their third derivatives, the equilibrium (and optimal) state of the system can be stable (by all participants), partially stable (by one of the participants) or unstable when each participant will play tug of war.

However, in the latest case it is possible to define a certain negotiation set $[E'(L_1); F'(L_2)]$, with only elements of which the wage rate may be established. Probably, in the interests of trade unions, to seek an increase of the wage rate, but to a certain limit – $F'(L_2)$. It is profitable for employers to reduce the wage rate, but not to zero, but to $E'(L_1)$. Of course, $W^*\in[E'(L_1); F'(L_2)]$, some deviations from W^* are possible under the pressure of one of the parties in accordance with the market conditions.

From the standpoint of the system as a whole, it is reasonable to balance the forces of the employers and the workers, which can be achieved through state regulation of wages. This is well illustrated by graphs that show the relationship between the volume of employment L and established different ways wage rate W (Fig. 5, 6).

The left and right sides (the halves before and after W^*) of these graphs can be arbitrarily combined, depending on the behavior of the third derivative of functions $E(L)$ (defines the left part of the graphs) and $F(L)$ (defines the right part).

The fig. 5, 6 show that only the optimal wage rate W^* (which could be set directively by the state) provides the maximum employment rate L^*. Under other conditions, when wages are not at the optimal level, unemployment will increase as $L^* > L_1 > L_2 > L_0$. If the wages are set by firms, employment will reach L_1, which is less than L^* (that is, the voluntary unemployment would increase), when overestimating the size of wages by trade unions, employment will decrease further more – to the value of L_2 (involuntary unemployment would increase), at the first point of the system breakeven employment L_0 will be the lowest.

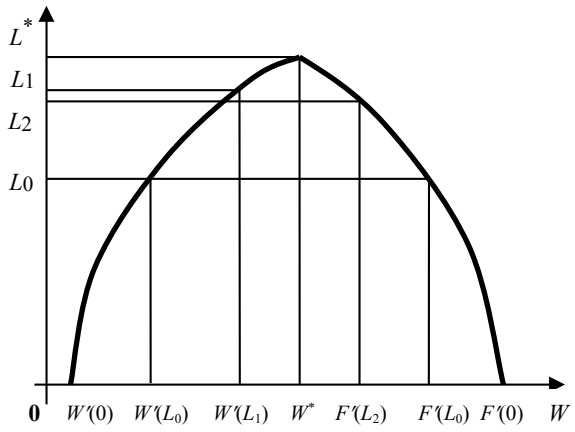

Fig. 5. Dependence of the employment rate on the wage rate at $W'''(L) > 0$, $F'''(L) < 0$.

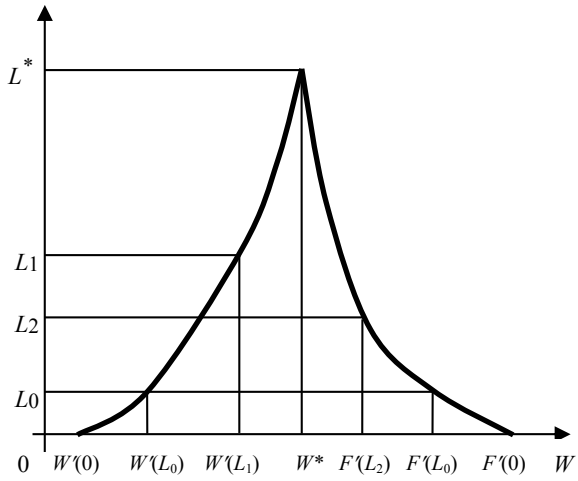

Fig. 6. Dependence of the employment rate on the wage rate at $W'''(L) < 0$, $F'''(L)> 0$.

Thus, the level of employment is adversely affected by both too low wages and too high. For the effective functioning of the firm-household system (which will be characterized not only by the highest employment but also by the maximum total net income and, accordingly, the maximum tax revenues in the state budget) it is necessary to set the optimal salary W^*.

Inside the system it is fundamentally impossible to establish the optimal wage level W^*, in which unemployment will be the smallest. Such a level of remuneration can only be established by a non-systemic body, whose interest will be the effectiveness of the system as a whole. This is a general theoretical conclusion regarding any such systems with a dual (affiliate and antagonistic) character of the relations of the participants.

An important feature of our system of firm-household is the presence of the body (the state), which direct interest is precisely to maximize the financial result of the system (the tax base).

3 Conclusions

So it is the state, from the height of its point of view, have to direct the actions of the opposing economic forces into the best point of optimum. With the help of state regulation of wage rates, not only the maximum replenishment of budget taxes is achieved, but also the maximum employment. By the influence on the system of the firm-household, the state, having established wages at W^* level, achieves the best conditions for the development of the national economy, namely, the maximum profit of the aggregated system of the firm-household, and therefore the maximum national income, the maximum tax revenues to the budget and the maximum level of employment, and hence the high level of solvent demand of households, the maximum effect of the interaction of the participants of the system, and therefore the achievement of economic growth of the economy.

It has been established that the maximum tax base and the highest level of employment are achieved simultaneously, with the same optimal level of remuneration. The achievement of any of these two possible state objectives (the maximum tax base or the highest level of employment) is fundamentally impossible without the achievement of the other (even if you want to). None of these goals can be achieved separately from the other.

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