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Law of Conservation of Real Wealth[1] and Rising Inequality

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Abstract

Nonfinancial and financial capital conflated in modern economy. Using accounting approach we separated them and compared the corresponding total values of nonfinancial capital and wealth. We consider these values to be equal. This statement is named "law of conservation of real wealth": real value of aggregate wealth is equal to the total value of nonfinancial assets. The law holds automatically by virtue of balance sheet identity, if financial assets' value equal to the counterpart obligations securing them. However such equality can be violated when securities freely circulating in modern financial markets lose their link with corresponding obligations. The resulting difference is equal to the divergence between the aggregate wealth and total value of nonfinancial assets, which indicates a violation of the law in nominal terms. We consider this divergence as excess unsecured component of wealth, whereas the real wealth continues to match the nonfinancial assets' value. Such unsecured wealth can only arise due to discrepancy between savings and investment, along with difference between total Haig–Simons income (including capital gains) and expenditures in real sector. It makes impossible to display correctly flows simultaneously with stocks. Deviations of securities' value from corresponding obligations commonly accepted as temporary. However, along with cyclical fluctuations the unsecured US financial assets value has been steadily growing since the 1980s, exceeding $11 trillion in 2016. We consider the observed nominal violation of the law of conservation of wealth is a consequence of unlimited capitalists' enrichment aspirations. Marketable securities are the tools they use to embody such desire; the effect enhanced by the procedures of corporate mergers and acquisitions. Yet, the unsecured wealth inflate financial bubbles; its growth turns out a sufficient condition for wealth and income inequality rising. Then the aggregate consumer demand growth is hindered, and appetite for capital investment decreases. Unsecured component of capitalists' profit is absorbed by an (unsecured) increase in the value of financial assets; it is not a source of capital investment; on the contrary, high financial returns contribute to crowding out investment from the real sector. Productivity growth slows down. Thus, increase in inequality reduces both aggregate demand and supply, which inhibits economic growth. US statistics confirms the above trends which led to the global crisis of 2007-2008. It has not cured the economy; unsecured wealth continues to grow increasing inequality, which dumps output growth. Black swans in 2020 have inspired inevitable arriving of new crisis.

1. Introduction

Surprisingly, but economic science until now has not developed a strong and clear understanding and interpretation of one of its key concepts – capital, and of the associated concept of wealth. And this is despite the fact that these concepts have always been in the center of attention of economists. The famous treatise of Adam Smith (1776) was named "The Wealth of Nations". Karl Marx named the work of his life "Capital" (1867). The economic bestseller in 2014 was "Capital in the 21st Century" by Tomas Piketty (2014).

Classical economists treated capital as an accumulated stock of physical assets, in accordance with the traditional understanding of the preceding centuries. Physical assets can differ from each other; nevertheless the amount of capital must be measurable. That is, different nonfinancial

[1] This law has nothing to do with the economic conservation laws which were derived with the help of the Lagrange equation by Samuelson (1970), Sato (1981) and others.

assets must be valued in standard homogeneous "financial" units. Measured in this way physical capital loses its individual characteristics and turns into "wealth", which is expressed in these units. Figuratively speaking, wealth is a reflection of the physical capital in the financial mirror.
Then, the capital has two interconnected natures: physical (more precisely, nonfinancial) and financial; the second cannot exist without the first. The thesis of interconnection between this capital's natures can be illustrated with a simple example. Let a household own only physical assets (real estate, land) that form its nonfinancial capital. The wealth of this household is equal to the market value of its nonfinancial capital. In this case, the wealth (financial capital) indeed is a reflection of the physical one. Physical capital, in turn, is an assurance of the financial capital in the given example.
However this example is not typical for the modern economy. Virtually any subject has assets (both non-financial and financial) and liabilities. The wealth (net worth) of the subject is equal to the difference between the value of its assets and liabilities. Therefore it is already difficult to pin the entities' wealth with specific nonfinancial assets.
Financial and nonfinancial capital really intertwined with each other in the modern economy. Therefore economists often view capital as a mixture of all kinds of assets, both physical and financial. For example, Piketty in his famous monograph (2014) writes: "*Capital includes all forms of real property (including residential real estate) as well as financial and professional capital…*" It turns out that it is more convenient to work with the financial nature of capital, forgetting about its physical basis[2], this is the main current trend, although it is not entirely correct from our point of view. Modern economists often consider financial capital and financial assets as self-sufficient substance capable of self-generating income and independent extended reproduction, without regard to the real sector of the economy. At the same time in our post-industrial world we can observe how financial capital "breaks away" from its physical counterpart and goes on a free voyage.
However, not all economists adhere to such understanding of capital. Piketty's book caused a wave of discussions and criticism, including about the confusion of the concepts of "capital" and "wealth" (for example, Galbraith, 2014; Varoufakis, 2014). One of our main goals is to separate the two intertwined natures of capital: nonfinancial and financial. In order to do this we will use an accounting approach. We believe that the principles of accounting are the embodiment of conversation laws in the economy. More precisely, it is the double-entry bookkeeping principle, the discovery of which is usually associated with the name of the Italian monk and mathematician of XV century Luke Pacioli (although there is a hypothesis that the ancient Incas also used this principle). Necessity to apply the double-entry principle in the process of economic analysis was emphasized by Max Weber (Swedberg, 2005) and Werner Sombart (1913/1953). One of the key examples of the use of accounting principles in macroeconomics is the system of national accounts. Initially such a system (NIPA) was created in the United States from 1931 to 1934 by Simon Kuznets (1941), the Nobel Prize in Economics winner, together with his colleagues. Similar systems have been created in other countries. National accounts are, in fact, the aggregated accounts of the national economy.
A consolidated balance sheet of the economy is constructed in Appendix A as the aggregate of the balance sheets of individual sectors and entities. The simplicity of the example in question does not diminish the generality of the consideration. The balance is built to compare the non-financial and financial side of the capital, that is, to compare the total value of non-financial assets and the total national wealth which is the aggregate own capital of ultimate owners-households for economy under consideration. To do this, we eliminated the counterpart financial assets and liabilities in the resulting balance as much as it was possible.
Indeed, the national wealth is not affected by mutual debts of households and enterprises to each other. These are debts for oneself when considering the total economy as a single entity.

[2] It could seems that we may forget about the Cambridge Capital Controversy (Cohen A. J.; Harcourt G. C., 2003) in this case. This controversy really had been almost forgotten after the victory of the financial concept of capital.

Financial assets only affect the distribution of total wealth between institutional units within the economy, without affecting its total value. It was claimed back in the XIX century by Henry George (1879):"*their* (financial assets) *increase or decrease does not affect the sum of wealth in the community*". By eliminating counterpart financial assets and liabilities, we simplify the consolidated balance sheet without affecting total wealth. Such elimination is possible, since any financial asset has its counterpart - the corresponding obligations (liability or equity) on the financing side of the issuer's balance sheet. Financial assets, unlike physical ones, often have no intrinsic value; the value of such asset is secured by the issuer's obligations. The issuer of the bond undertakes to repay it at a certain date with the interest. The issuer of the shares provides their value by his own capital (corporate equity) and by the flows of income (profits and dividends). Thus, the obligations corresponding to the financial assets are the assurance of these assets.

If we were able to eliminate all financial assets with the corresponding obligations securing them, then only the value of national wealth would remain on the right (financing) side of the consolidated balance sheet, and only the value of all non-financial assets would remain on the left (asset) side. In such case these two quantities would automatically be equal to each other by virtue of the balance sheet identity.

However, it turns out that it is not always possible to eliminate mutually all financial assets with counterpart obligations. If financial asset is a security whose price is formed in modern stock markets, then this price is not always met the value of the corresponding obligations on the financing side of the balance sheet of the issuer of this security. Shareholder value, for example, may not be equal to the own capital of the issuer of the shares, and the value of bonds - to the payables of the bonds issuer. Indeed, changes in shareholder value are not required to exactly correspond to the results of the economic activities of the issuing corporation. It may happen that the value of the shares has increased, while the own capital of the corporation has not changed, or changed to a lesser extent. In this case, the issuing corporation “does not confirm” the increase in shareholder value by increasing its obligations. As a result, a part of the financial assets’ value is not secured by the corresponding obligations. We call such part which is equal to the difference between the value of financial assets and the counterpart obligations as "the unsecured part of the financial assets' value" (or, more simply: "the unsecured value of financial assets").[3]

The unsecured value of financial assets increases the size of national wealth. This follows from the identity of total assets and liabilities of the resulting consolidated balance sheet, presented in Section 2. National wealth equals the total value of nonfinancial assets plus the unsecured value of financial assets. We also call the as "unsecured" the part of the wealth which corresponds to the unsecured financial assets' value (Bezemer and Hudson, 2016 called such unsecured part of wealth as “virtual wealth”). The connection between these two quantities is intuitively clear: an unsecured growth in the value of a financial asset is both an unsecured increase in the wealth of the owner of this asset, and, therefore, an unsecured growth in total wealth.

The phenomenon of unsecured wealth is at the center of our consideration. At first let us try to figure out how this (unsecured) part of wealth appears, and how to distinguish it from the secured one. Indeed, at the time of occurrence (emission), the value of the financial asset is equal to the value of the corresponding obligations automatically. In the absence of developed financial markets in the "archaic" economy, this equality is subsequently preserved too (this issue is covered in Section 3). Accordingly, unsecured financial assets and unsecured wealth are absent in this case.

However the equality of financial assets and their corresponding obligations’ values can be violated, and it is violated in fact, if the value of financial assets is determined on modern electronic trading platforms. In this case the market value of the asset loses its connection with

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[3] Here and below, by “unsecured” value we mean the part of the financial assets’ value that is not backed by any obligations at all in the issuer's balance sheet. Such unsecured assets should not be confused with financial assets with unreliable collateral (for example, when the issuer is a potential bankrupt with negative equity).

the corresponding counterpart on the financing side of the issuer's balance sheet. Thus, the presence of modern financial markets is a necessary condition for the existence of unsecured wealth.

The growth of total wealth is considered in detail in Sections 3 and 5, using as the example two mini-economies with identical real sectors. The difference between economies is the absence (in Section 3) or presence (in Section 5) of the modern stock market. Economic activity in the real sector, which is the same for both economies (the only profitable sales transaction in our example), leads to different financial results. In both cases the shareholder value of the profitable corporation and the total wealth grow. However in the second case, these values grow stronger due to the unsecured component. Analysis for “archaic” economy (without modern stock market) shows that the growth of wealth has its roots in the real sector. Such growth corresponds to the growth of non-financial assets accumulated at the expense of the non-consumed part of the value added; and it is secured therefore. On the contrary, the additional unsecured increase in wealth for the modern economy, discussed in Section 5, has no direct connection with the real sector. The corresponding additional income, due to which unsecured growth of wealth occurs, is also called as "unsecured" by analogy.

The same activity in the real sector of the economy leads to different values of total wealth, depending on the presence or absence of a modern stock market. Which of these values more accurately reflects reality? The root cause of the formation of unsecured wealth is the excess of the value of financial assets relative to the corresponding obligations; in the case under consideration it is the excess of the shareholder value relative to the own capital of the issuing corporation. Therefore, the question “how to calculate the total wealth correctly?” in this case comes down to the question “how much is a corporation actually worth?”

There are two main approaches to business valuation - cost and income methods. According to the cost (replacement) method, the value of the enterprise is equal to the value of its own capital; in other words - how much it costs to create exactly the same enterprise. This methodology is applied to corporate business valuation in an archaic economy, discussed in Section 3.

In modern conditions, the current shareholder value of a corporation is defined in another way, in the stock market; this value largely depends on the expected in the near future value, which in turn is determined by the income method. If future cash flows are not known exactly, the income capitalization method (a kind of income method) is applicable for asset valuation. Section 4 analyzes the effect of such an algorithm and implements mathematical modeling of the dynamics of market shareholder value. The constructed model visually explains the observed unstable dynamics of the shares’ price which is determined by a highly liquid stock market. It turns out that instability exists because of a contradictory assumption. The method of capitalization of income, usually used for business valuation, involves extrapolating of the short-term expectations for the long term, which is doubtful. When calculating the value of corporation, it is assumed that the current or even expected change in the yield generated by it should last at least for decades; while the income includes additionally the revaluation of shares. We believe that it is not always possible to trust the market value of financial assets formed in this way. We consider the unsecured part of the shareholder value, which is not backed by anyone's obligations, as illegitimate and excessive.

Here we come into a fundamental contradiction with the generally accepted mainstream view, which legitimizes the valuation of corporate business, based on the method of capitalization of income. The mainstream arguments and our objections are discussed in detail in Section 5. On the one hand, the value of a corporation is equal to its shareholder value; on the other hand, the exact same corporation can be created at the replacement cost, which is equal to the amount of its own capital. And these two amounts may not be equal; and in this case it is not clear how much the enterprise really stands.

At the first glance, the generally accepted point of view is understandable and reasonable, that considers any asset as a potential source of capital income, be it a piece of land or a block of shares. It is also clear that the value of such an asset should be directly proportional to the

income generated by the asset. However we are confident that such proportionality should not be observed at any arbitrary moment of time, but only in the long term. And we believe that in the long term the cost-based and income-based capital valuation methods should not give different results. After all, it is the norm to evaluate the value of a noncorporate business, including in national accounts systems, in accordance with the own capital of the corresponding enterprise, that is, according to the cost-based valuation method. And if exactly the same enterprise will have a corporate form of ownership, would it be reasonable to evaluate its value in a different way, by the income-based method? We are sure that the value of business should not depend on the form of ownership of this business.

Therefore we insist on the illegitimacy of unsecured income and wealth, which arise as a result of the valuation of shares by the income method in the modern stock markets. We believe that unsecured components do not increase the real amount of income and wealth. We can generalize the obtained conclusion to other financial assets. Faster growth of their value (in excess of the value of the corresponding liabilities) is not secured too. In other words, the part of the value of financial assets may also be excessive and illegitimate, as well as the corresponding part of income and wealth.

However, unsecured income is present in the modern economy, being a consequence of the functioning of financial markets. And what are the consequences of this? The process of the emergence of unsecured income that is the source of unsecured wealth is formalized in Section 6. It turns out that the inevitable consequence of this process is a paradox: total income is not necessarily equal to total expenditures, and total savings - to capital investments.

The reason for the paradox is the difference in interpretations of the concept of total income. The traditional understanding of this term implies the total amounts due to owners of production resources used in the manufacturing of a national product. This income, commonly referred to as national income in the systems of national accounts, corresponds to the total value added. Therefore the difference between national income and consumption (savings in the real sector) is automatically equal to the difference between total output and consumption (total capital investment that forms a stock of nonfinancial capital). However, the equality between investments and savings, which automatically occurs while the traditional interpretation of the amount of income, can be violated if the income is treated in another way.

The fact is that the financial side of capital (wealth) is formed, in contrast to the physical side, at the expense of non-consumed income (savings) of the ultimate owners - households. Total household income includes financial income, including unsecured one, corresponding to unsecured growth in the value of financial assets. Such total household income is usually named as Haig–Simons income (Haig, 1921 and Simons, 1938). Haig – Simons total income can exceed national income (due to the unsecured component), and then the total savings exceed total capital investment. The difference between the savings and capital investments (equal to the difference between Haig–Simons income and national income) corresponds exactly to unsecured income, which is the cause of the paradox under consideration.

This paradox, by the way, is a simple and clear explanation of the observed non-compliance with the Say law. If the total income does not correspond to the total output, then the aggregate demand determined by the income will not correspond to the aggregate supply corresponding to the total output (value added).

Another controversial consequence of the existence of unsecured income and wealth is the inability of the correct unification of the flows and stocks accounting. These values are interrelated, and in order to close the system from an accounting point of view, it is necessary to take both into account simultaneously. The flows of income, value added (output), savings and investment affect the value of accumulated stocks (capital). And the amount of accumulated capital, in turn, affects the income flows.

Such unified systems of accounts appeared somewhat later than the NIPA accounts mentioned above; in the United States, such accounting, where stocks are taken into account simultaneously with flows (Flow of Funds data), has been maintained since 1945 by the Federal Reserve

System. Such systems also contain accumulative accounts that are aggregated into balances in the context of sectors of the economy at the reporting date, together with the accounts of national income and product. At present the standard 2008 SNA is in effect, which is developed and recommended for uses by the United Nations Statistical Division (SNA) for national accounting systems, that takes into account both flows and stocks. If possible, we will use the terminology that complies with this standard.

The conventional methodology provides the traditional way to account income (as national income) in the aforementioned unified systems of national accounts, while the capital stock is reflected as total wealth. The total wealth that is made up as the sum of own capitals of the ultimate owners-households for the economy under consideration (in the absence of the government sector) includes also the unsecured component. Indeed, a part of the households' wealth is formed at the expense of financial assets held by them, which are recorded in accordance with their market value, which includes the unsecured component.

Since the “traditional” income covers exclusively the real sector of the economy, the “traditional” aggregate saving which is equal to the capital investment forms only a secured part of wealth, corresponding to the value of nonfinancial capital. There are no sources of the unsecured wealth formation in the real sector; flows of real income and savings do not participate in its accumulation. The described problem of insufficient incomes of the real sector is being solved today in different ways.

According to the 2008 SNA standard, total income is calculated according to the traditional method, as the income received in the real sector. But at the same time the value of financial assets in the balance sheets of the owners should be revalued when their market price changes. It is precisely at the expense of such revaluations, called as "real holding gains", that the unsecured part of wealth is formed. In the Godley and Lavoie (2007) textbook, see tables 2.2 and 11.1, the problem is solved in another way: Haig–Simons income appears as income. Both methods allow compensate the lack of real income, which is not sufficient to increase the nominal wealth value. However another problem arises.

The growth of total wealth on the financing side of the balance sheet coincides with the growth of the total net assets, by virtue of the balance identity, but the growth of the unsecured component of wealth occurs “at the wrong address”. It would be logical if the increase in the value of a financial asset would be accompanied by the equal increase of the obligations on the financing side of the issuer's balance sheet. However this is not the case for the unsecured component of its value. Let us explain what has been said by comparing nonfinancial and financial assets.

Any difference between the value of a physical asset and the amount of the counterpart obligations is impossible. If a price of a physical asset has risen, for example a piece of land belonging to you, this concerns only one subject (you); only your balance sheet and your own capital (wealth) will change, while the balance sheets of other subjects will remain unchanged. In contrast, the owner of a financial asset and its issuer that bears the corresponding obligations are different entities. Imagine that the value of a share has grown excessively while the own capital of its issuer is unchanged. A share owner can make a profit by selling it; in this case the total obligations and total wealth will increase, and the identity of both sides of the aggregated balance sheet would not violate. However, the increase in wealth will take place not at the address where it should have happened: not at the balance sheet of the stock issuer, but at the former owner's balance sheet. It is this profit of the random merchant that is in this case the “source” and “security” of the growth of the value of the shares in question from an accounting point of view. In order to eliminate the latter problem and preserve equality between the value of financial assets and their counterpart obligations, the corporations' shareholder value is often reflected as the liabilities of the issuers in the aggregated balance sheet of the economy. Such logic is present both in the textbook Godley and Lavoie, and in US Flow of Funds tables (namely S.4 and S.5). To legalize excess unsecured growth of shareholder value, constructors of integrated balance sheets mechanically and voluntaristically transfer the obligations from

stockholders and dealers to issuers. In this case the obligations are mistakenly imputed to corporations. Such a construction looks far-fetched, because the subject (issuer of financial asset) cannot have obligations, the value of which can change independently of him, for example, due to changes in the discount rate of the Fed. Appendix F provides additional examples of the contradictions that arise in the US statistics in connection with unsecured wealth.

Our view on the illegitimacy of unsecured wealth is also confirmed by the statements contained in the 2008 SNA standards. In particular, according to p.2.58, *financial asset and its liability counterpart have to be recorded for the same amount in the creditor and the debtor accounts;* it follows also from p.13.4 that national wealth in a closed economy must correspond to the total value of nonfinancial assets.

Having recognized the legitimacy of the unsecured value of financial assets and unsecured wealth, we inevitably face the insoluble contradictions described above. It turns out to be impossible to calculate income, savings, and wealth correctly and unequivocally. Contradictions disappear only if the entire value of the financial assets is secured by the issuer's obligations. To avoid problems, it is necessary to declare the unsecured part of their value as illegitimate, together with unsecured income and wealth.

From this we make an extremely important conclusion. We are sure that real wealth and nonfinancial capital had to match each other; these are 2 sides of the same capital. Then, we formulate here the law of conservation of real wealth:

Real total wealth in a closed economy is equal to the total value of nonfinancial assets.

Above we figuratively called wealth the reflection of nonfinancial capital in the financial mirror; an unsecured component distorts this image. A necessary condition for such distortion is the presence of developed financial markets. In this case, the conservation law formulated above may be violated formally. However, we are confident that such a violation is only nominal, while the equality between the real values is preserved. The non-observance of the conservation law in nominal terms means that if you try to divide existing nonfinancial assets among ultimate proprietors (households), then they will not be enough for everyone at their actual value. That is, the excess financial assets and the excess wealth are a potential source of inflation.[4]

In the presented work we show that the unsecured part of the value of financial assets, as well as the corresponding part of total wealth is not legitimate. The emergence of these values is associated with unsecured incomes, which cause a disparity between total incomes and expenses, savings and investments. It does not allow linking correctly the income and wealth to each other.

Why economists do not pay enough attention to these contradictions? Indeed, the actually observed unsecured part of financial assets' value and of wealth is contrary to the current 2008 SNA standard. Probably, economists turn a blind eye to this question, considering unsecured wealth to be a temporary deviation from the norm, which is related to the volatility of the stock market, and not a permanent problem. Perhaps these economists believe that such phenomena do not entail long-term consequences, and therefore they can be ignored (for example, Solow, 2014).

However, we do not consider the emergence of unsecured income and wealth as a neutral phenomenon. Indeed, the stock market is quite volatile, and the excess value of financial assets that has arisen in the expansion phase can disappear during the recession, along with excess wealth, see Figure 1. Yet, the periodic processes of reducing the value of shares do not always occur smoothly. After all, huge financial bubbles can be formed during the expansion phase. The subsequent collapse of these bubbles provokes instability throughout the whole economy, and sometimes even causes a crisis. Figure 2 shows the fluctuations in the shareholder value and total output, while the schedule of changes in the shareholder value is shifted a year later; in this case, there is a good correlation between the curves. That is, stock market fluctuations are ahead of

[4] Of course, the potential inflation should not necessarily become a real. Nevertheless, an excessive, not secured part of the nominal wealth must ultimately dissolve either by inflation of nonfinancial assets, or as a result of a decrease in the cost of financial assets.

fluctuations in the real economy, which speaks in favor of the statement that stock price fluctuations cause fluctuations in investment and output.

Moreover, the thesis is not true that the deviations of the value of financial assets from the value of the liabilities providing them is an exclusively random phenomenon, and that this deviation can be neglected when averaging the cyclic component. When considering the entire range of US financial assets, it turns out that the unsecured component of their value has been growing continuously since the 1980s and, according to our estimates, amounted to at least 11 trillion dollars in 2016, sees Figures 5 in Section 8 and F5 in Appendix F.

Another negative from our point of view consequence of the existence of unsecured income and wealth is the rising inequality. The issue of rising inequality and its connection with the growth of unsecured wealth in the modern economy is discussed in Section 7. The emphasis is placed primarily on the increase in wealth inequality, which in turn is the main reason for the rising in income inequality. We have shown that the growth of unsecured wealth is a sufficient condition for the outstripping growth of the largest fortunes and of the increase in wealth inequality. Our study of this issue complements conclusions obtained by Piketty (2014). Strictly speaking, his well-known condition $r>g$ is not sufficient for the rising in wealth inequality, because it does not take into account the fact that a part of the profit can be consumed (Milanovic, Branko 2015; Ray, Debraj 2014; Bernardo at all 2014). A sufficient condition for the outstripping growth of the largest fortunes is a tougher inequality, $rs_i>g$ for the wealthiest households ($i \epsilon C$), which is called here as ortundition, where s_i is the propensity to save of i-th household. Since the saved share of income s_i may differ for different households, the mentioned inequality may or may not be fulfilled (by default we assume $r>g$). We have shown mathematically rigorously that the wealth of households for which $s_i<g/r$ (the refined Picketty condition is not fulfilled) is proportional in the long run to their wages and propensity to save. It grows at the same rate as labor productivity and GDP, and is independent of the initial distribution of wealth. Thus, if the refined Picketty condition were not fulfilled for all households, then the wealth inequality would correspond to the income inequality, which contradicts the observed data.

But if one or several households has such a large capital income that they are not able to consume a significant part of it, so that the refined Picketty condition is fulfilled for these subjects ($rs_i>g$), then their wealth grows faster than GDP. The increase in wealth inequality is inevitable in this case. Both the rising in wealth inequality and in income inequality are linked by positive feedback: the growth of the first accelerates the growth of the second and vice versa.

What is the impact of the capitalists' profits, and of the rising inequality on the economic growth? This issue is widely debated today, and a number of economists believe that the influence of these factors on the growth of the economy is positive. Their point of view is substantiated in the following way: “Of course, capitalists’ large profit (capital income) share means a smaller share of wages (labor income). However, after all the profit obtained is reinvested by proprietors into the real sector, which leads to an increase in capital-labor ratio, labor productivity, total output and total income. And the fact that workers will lose (as it may seem to them) due to the capitalists’ large profits is more than offset by the accelerated growth of their wages due to the growth of labor productivity.”

We do not fully agree with such logic. Indeed, in successfully developing economies the lion’s share of profit is usually reinvested in the real sector. However, a much smaller part of the profit is reinvested in the real sector in the modern developed economies. A part of the received financial profit is not secured; it has no roots in the real sector. Total savings exceed total investment in the real sector by the amount of unsecured profit, as we have shown in Section 6. Hence the rich proprietors are not completely reinvesting their huge savings in the real sector; the excess is absorbed by an increase in unsecured wealth (through the increase in the unsecured component of financial assets value). Unsecured income is “reinvested” in financial assets (increasing their excess value), not in capital assets. These arguments disprove the above argument by proponents of the utility of large profits and high inequality for economic growth. The large unsecured financial profit does not mean the large capital investment and does not

contribute to the growth of labor productivity. Rather the opposite, the high yield in the financial sector may lead to crowding out capital investments from the real sector.

We share the view of a number of economists (Stiglitz, 2012; Rajan, 2010; Fitoussi & Saraceno, 2009; Frank, 2010; Flamant, 2015) about the negative impact of inequality on economic growth. The growth of real income and consumer demand of poor households slows down; at the same time, wealthy proprietors are not able to consume all their additional capital income. As a result, the growth of aggregate consumer demand is inhibited. Thus, both the growth of aggregate demand and capital investment, which ensure the growth of labor productivity, are inhibited. As a result economic growth is slow down.

The observed statistical data of the US economy confirms our statements. The profits obtained in the real sector are really weakly reinvested, especially since the 2000s, as a result of which the growth rate of the aggregate real output is scanty (Fig. 7). Instead of the real sector, profits are "reinvested" in financial one: the total volumes of financial assets and financial profit are growing rapidly (Fig. 6).

The slowdown of economic growth is not the only objectionable consequence of the rising inequality. A numerical simulation of the inequality dynamics for the modern economy, which is carried out in Appendix E for 100 households with different fortunes and income, shows the possibility of additional negative circumstances. Inflation can arise due to splashing out a part of excess income on the consumer market as an additional demand. The most realistic 3d scenario considered in the appendix, taking into account the desire of poor households to maintain their standard of living, gives disappointing dynamics: inequality is increasing not only due to the advancing rate of enrichment of the rich, but also due to the direct flow of wealth from the poor to the rich. Net lending (the difference between savings and capital investment) of the poorest households becomes negative, so these households move towards their bankruptcy. US statistics shows that such a scenario seems to be actually occurring (see Figure 4). The bankruptcy of (poor) households makes the economy much less stable and contributes to crises.

We have clarified the essence of the phenomenon of unsecured wealth, the mechanism of its occurrence and growth, as well as its negative role for the growth and sustainability of the economy. Let's switch to the question of the cause of this phenomenon. We believe that its initial reason is the "animal spirits" of capitalists (Keynes, 1936), that is, their desire to maximize their profits and wealth. Modern financial markets provide an excellent way to achieve these goals. Volatile highly liquid financial assets, whose market value is not tightly bounded to the amount of obligations securing them in the balance sheet of the issuer, allow you to generate unsecured financial income and wealth. It is the latter that are the source of enrichment of wealthy proprietors. A direct consequence of the growth of unsecured wealth is the inflating of financial bubbles, stock market volatility and potential inflation. A "side effect" of the capitalists' main aspirations being realized is the rising inequality, which, in turn, is the reason for the inhibition of economic growth and the bankruptcy of the poorest households. The initial causes and their consequences are shown on Scheme 1 and 2 in Section 7. Both the direct and indirect consequences of proprietors' animal spirits negatively affect the economic growth and stability. The result could be a financial crisis.

Thus, the existence of excessive and unsecured part of financial assets' value, which means a violation of the law of conservation of wealth in nominal terms, is not a neutral phenomenon, but entails numerous negative consequences. And all such consequences, observed in recent decades, arises due to the functioning of modern financial markets, which are a cause of instability. Moreover, having originated initially, unsecured wealth subsequently extensively reproduces itself, generating new unsecured income.

Why do not we see so far an effective fight against this evil by the authorities? We support the political and economic recommendations of the researchers mentioned above (Stiglitz, 2012; Rajan, 2010; Fitoussi & Saraceno, 2009; Frank, 2010; Flamant, 2015), and we believe that the market power of capitalists should be limited. Tightening of antitrust laws and rules for the functioning of financial markets is necessary, as well as raising the minimum wage; progressive

taxation of income and capital. Why not expand the application of a small financial transaction tax on securities trade? Such a tax exists in India (Securities Transaction Tax) and in some other countries; the feasibility of its use is being discussed more actively after the crisis of 2008 (see, e.g., Baker, 2016). This could sharply reduce the attractiveness of exchange speculation, and at the same time it would not affect the real bargains of buying and selling businesses. Picketty's wealth tax also may weaken the rising in wealth inequality and related negative trends. But these ideas do not come true. Instead of this the best minds invent new financial instruments now. The answer to the question is obvious: the functioning of modern financial markets is profitable to someone; this evil is useful to somebody.

Throughout the history of their existence, financial assets were used on occasion to obtain an additional financial income, which is not necessarily related to the real sector. This attracts fans of easy money; Section 8 presents a brief historical overlook on this topic. The financial instruments to be used must have certain properties. The issue and turnover of such appropriate instruments should have a minimum of restrictions; highly liquid assets are preferable, the price of which may experience sharp fluctuations. One of the most popular assets used for financial speculation are equities. Equities which are quoted on the stock market combine both price volatility and liquidity. But significant deviations in the shareholder value from the issuer's own capital are clearly visible, that indicates an increased risk, restrains the excitement of stock speculators and limits the capabilities of this instrument.

To expand these capabilities, entangled ownership structure of companies can be used, when the first one owns a part of the second and vice versa. Such ownership structure may result from merger and acquisition procedures. The shareholder value of entangled corporations can vary within wide limits without objective reasons, and this process can be managed. In this case, the equality of shareholder value and issuer's equity is not necessarily broken, so the "games" with the value of their shares are barely noticeable. The entangled ownership structure makes it possible to use not only stocks, but also various funds' shares for obtaining financial profit. This is shown in Appendix B.

Other modern financial instruments, such as miscellaneous assets, can be used to generate unsecured income and wealth, in addition to stocks and fund shares. The value of such financial assets must be equal to the corresponding liabilities according to accounting principles. However, in fact, part of the increase in the value of such assets is not secured by the growth of the liabilities. American statistics is forced to shamefacedly call as "discrepancy" the unsecured part of the value of the miscellaneous financial assets, which is about 11 trillion dollars in 2016 already exceeding half of GDP, see Figure 5.

In the historical perspective, the government authority from its side often has been trying to limit the possibilities to obtain unsecured financial profits by private business. At the same time financial tycoons in pursuit of it constantly tried to circumvent the existing restrictions. The weakening of the role of the governments in a number of countries today, due to the globalist tendencies, seems also to be the result of this struggle.

Actual observations suggest that the capitalists to a large degree have achieved their goals in recent decades. Nothing really restricts the issue and turnover of most financial instruments. The greed has won, but this victory is Pyrrhic. A substantial part of today's profit is not secured. It crowds out capital investment from the real sector, inflates bubbles of unsecured value of financial assets, and contributes to the rising in inequality, up to the bankruptcy of the poorest households. All this, apparently, provoked the global financial crisis of 2007-2008. Moreover, the crisis has not cured the economy, the existing painful trends persist: High profits in the real sector is still spent not on capital investments (Fig. 7), but on speculation in the financial sector (total financial assets continue to grow, like financial profits, Fig. 6); as a result, the unsecured part of financial assets' value is growing rapidly, inflating financial bubbles (Fig. 1 and 5); unsecured income and wealth contribute to the increase in inequality, including through the redistribution of wealth from poor workers to rich capitalists (poor households' net lending is negative again, see Figure 4), the impoverishment of the poor and their bankruptcy may be the

result. The law of conservation of wealth continues to be violated in nominal terms; this is the inevitable consequence of the capitalists' desire to maximize profits while the operation of modern highly liquid free financial markets. Such violation does not bode well for the economy in the foreseeable future; sooner or later, the unsecured financial asset's bubble had to burst again, which, in fact, happens in 2020.

2. National wealth versus nonfinancial capital. Consolidated balance sheet of a whole economy. Double entry bookkeeping concept.

In this section we will compare two different (financial and nonfinancial) sides of capital: national wealth and total nonfinancial capital, in a simple two-sector economy (households and business).

Wealth is the financial side of capital, it's reflection in the financial mirror, as we have described in the previous section. Our main task here is to calculate the value of national wealth, and we will use the accounting approach to solve this task. The wealth of any subject (fortune) means its own capital which is equal to the net assets, that is, the difference between the values of assets and liabilities. At first glance it may seem that the national wealth (aggregate equity of the national economy) must be equal to the sum of the equities of all subjects within this economy. However this is not so, we need to exclude a double counting. The own capital of a private enterprise is simultaneously recorded as a financial asset (property rights) in the balance sheet of the owner of the enterprise, thereby increasing the net worth of the latter. Therefore, only the equity of the end-owners should be count up. We consider here a simplified two-sector economy (households and business). In such an economy, everything ultimately belongs to households. Therefore, the national wealth is equal to the aggregate own capital of all households.

Another (nonfinancial) side of capital in a closed economy (without taking into account the external world) is the entire aggregate of physical assets: the natural wealth and man-made values that belong to a given nation at a certain time. The method of calculating of wealth is different from the method of calculating of nonfinancial capital. In the pre-industrial era, there was no difference between these two quantities; both methods of estimating national capital gave the same result. We call such equality between the values of the households' own capital and of the total nonfinancial assets as "the law of conservation of wealth" in this paper.

Since the XX century, the situation has changed significantly. The aggregated value of household net assets (total wealth) can strongly differ from the total value of nonfinancial assets, that is, the conservation law can be broken in nominal terms.

Occurrence of any financial asset (including an issue of securities) is necessarily accompanied by the appearance of an obligation in the issuer's balance sheet. The issuer, writing out a bill, is simultaneously burdened with an obligation to pay it off in accordance with the maturity term. Ownership of the enterprise or of its part is secured by the net assets (equity) of the enterprise, and by its revenues. At the time of issue and initial placement, the value of securities is equal to the amount of the corresponding obligations (liabilities or equity) automatically. However further, under the free circulation in the financial market, the price of the security may change. Hence, it can deviate from the value of the corresponding obligations in the issuer's balance sheet. We show here theoretically that if there is a difference between the market value of financial assets and of the book value of their corresponding obligations in the balance sheet of the issuers of these assets, then the difference between the aggregate wealth and the total value of the existing nonfinancial assets simultaneously occurs. To justify this assertion, we have built in Appendix A a consolidated balance sheet of the hypothetical national economy as a joint "enterprise", by aggregating the balance sheets of all its participants. Household balance sheets are also included in the consolidated statement.

A balance sheet is a snapshot of a company's financial condition at a certain moment in time, usually at the end of the reporting period. It has two sides: assets, on the left and financing on the right; the last is divided in two parts, liabilities and ownership equity. Asset is a resource which expected to bring economic benefit to its owner in the future; then the assets have a plus sign for

him. However part of this benefit will have to be given to creditors; therefore, the liabilities have a minus sign, although they are historically reflected with the opposite (positive) sign on the right side of the balance sheet. Liabilities can be viewed as a "source" of assets, as well as equity. Indeed, the more we borrow, the more we will have assets. Thus, the right side of the balance sheet (financing) is the source of its left side (assets). This thesis makes clear the most important property of balance - the equality of its assets and financing. The "accounting equation" is the consequence of this equality: the own capital is equal to the difference between the assets and liabilities.

The equality of both sides of the balance sheet is a corollary of the principles of double entry bookkeeping. Let us briefly recall the essence of these very important principles.[5]

Assets, liabilities and owners' equity contain corresponding groups of accounts. A separate account designed to count up the value of existing items in the balance sheet and in the income statement. For example, separate accounts reflect in monetary terms the items: «Cash», «Goods/Inventories», «Accounts receivable» (assets); «Accounts payable» (liabilities); «Owner's equity», «Profit», etc. Different accounts present both flows (measured over a period) and stocks (measured at the end of a period). Business transactions are reflected by the accounting entries which change the balance of referenced accounts. The entries are made by the terms "debit" and "credit"; in bookkeeping they denote an increase or decrease to the balance of corresponding accounts. Double-entry accounting is based on the fact that every transaction has equal and opposite effects in at least two different accounts, so that the debit is balanced by a credit. This is a kind of conservation law. The identity between assets and financing of the balance sheet does not change. Its left side should always equal the right side.

For example, company A received from supplier B goods worth $ 2500. This transaction is recorded in the company's accounting system by debiting the account "Goods" and by crediting by the same amount the "Accounts payable to suppliers".

Company A:

Account	Debit	Credit
Goods	$ 2500	
Accounts payable to suppliers		$ 2500

Since the values of debit and credit for each accounting double-entry must be equal, we will use another convenient form of the bookkeeping entry recording:

Company A:

Account Debit	Account Credit	Sum
Goods	Accounts payable to suppliers	$ 2500

Credit (decrease of the account balance) to the "Accounts payable" leads to an increase in liabilities in the balance sheet, since the balances of the corresponding accounts are reflected with the opposite sign on the right side of this statement. Indeed, growing of the negative (credit) balance of the "Accounts payable" means increasing in liabilities. Then, the result of the transaction is a simultaneous increase in assets and liabilities of the balance sheet. Equality of both parts of the balance sheet is preserved. The company's own capital also remains.

A cash payment to the supplier of the received goods in the amount of $ 2500 is recorded by the credit to the account "Cash" and at the same time by the debit to the "Accounts payable to suppliers" for the same amount.

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[5] Below we present the items that are known to every bookkeeper. But despite the simplicity, these concepts are usually hard to perceive by a non-accountant, perhaps because of some of their intricacies and specificity.

Company A:

Account Debit	Account Credit	Sum
Accounts payable to suppliers	Cash	$ 2500

Accounts payable are repaid; the debit and credit of $ 2500 to this account gives zero balance. Both assets and liabilities of the balance sheet are reduced now. As a result of both transactions the amount of cash decreased and inventories increased at the same amount. The balance equation is preserved, as is the equity of the company A.

A balance sheet can be build for each subject of the economy; as a rule, such a procedure is mandatory for legal entities at the reporting date. By combining the balance sheets of all subjects (legal entities and households), one can obtain an aggregated balance of the national economy. Considering the entire national economy as one large enterprise, it is necessary to consolidate the aggregated balance sheet, by eliminating the internal "debts to oneself". A routine description of the construction of the consolidated balance sheet of the entire economy is given in Appendix A, where the simplest case is considered without taking into account the government and the outside world.

In the abovementioned appendix we apply the netting technique for consolidated balance sheet, which differs somewhat from the standard approach. After the conventional consolidation the debts between various entities become intercompany debts for the joined enterprise, and then they can be eliminated. Sales between different entities, when consolidated, become similar to inter-shop moves of a large integrated enterprise. Then according to the standard consolidation procedure, the profit from such shipments is generally not reflected in the united accounts.

We turn off the internal debts too, but the internal profit is not reset, unlike the standard approach. This can be represented as if all entities in the national economy had acted individually up to a certain point, and at the time of drawing up the balance sheet they would have decided to consolidate. Then all assets previously acquired by entities must be reflected in the balance sheet at the purchase price (with the seller's profit). Nevertheless, the debts between the entities after consolidation no longer necessary to take into account, they become internal and do not affect the total wealth.

Eventually, we have simplified the resulting balance as much as possible, which allows us to focus on the relationship between the total values of financial assets and of corresponding obligations. This, in turn, makes it possible to compare the values of national wealth and of total nonfinancial assets. We take into account only equities and bonds as securities for simplicity. The resulting balance from Appendix A is shown below:

Consolidated balance sheet of the national economy

Assets

1. Total amount of debt securities (bonds, promissory note, etc.) owned by all entities (the households, nonfinancial enterprises, central bank and commercial banks)
2. Total amount of equities, partner shares and other property rights owned by all entities
3. Total amount of nonfinancial assets owned by all entities

Liabilities

1. Total debt on debt securities (bonds, promissory notes) issued by enterprises
2. Total own capital of all business entities (enterprises and banks)

Equity

1. The wealth (total equity of all households)

The items on the assets side and on the financing side in the balance sheet are logically related to each other. Item 1 in the assets reflects the total market value of the issued debt securities. These financial assets are secured by the liabilities of their issuers, the amount of which is reflected in item 1 in the liabilities.

Item 2 in the assets reflects the total market value of business ownership. These financial assets are secured by the net assets of the enterprises and banks, more precisely by their own capital (equity). Total own capital of all business entities is reflected in item 2 in the liabilities.[6]
The value of these financial assets (items 1 and 2) and the counterpart obligations may or may not coincide. At the time of occurrence, the value of any financial asset is automatically equal to the value of the corresponding obligations in the issuer's balance sheet. If such equality will occur for all financial assets, then the total value of financial assets, reflected in items 1 and 2 in the assets should be equal to the value of the corresponding financing: items 1 and 2 in the liabilities. Then, by virtue of the identity of the total values of both sides of a balance sheet (accounting identity), the value which is reflected in item 3 in the assets should be equal to the value which is reflected in item 1 in the equity. This means that the total value of nonfinancial assets is equal to the national wealth which in turn is equal to the own capital of households (in the absence of the state and the outside world). The above law of conservation of wealth is preserved in this case.
However some of financial assets are securities that imply their free market circulation and pricing. In this case their market prices are formed on the stock exchange. Therefore, the deviations are possible of the value of the financial assets from their corresponding obligations' value. If such deviations will take place, and these two quantities are not equal, then national wealth (item 1 in the equity) should differ from the total value of nonfinancial assets (item 3 in the assets). This important conclusion follows from the identity of the values of total assets and liabilities of the balance sheet.
The subject of further consideration is the following: In which cases and for what reasons are the values of national wealth and total nonfinancial assets equal or not? What are the consequences of their inequality?

3. Capital accumulation process when the law of conservation of wealth is valid in nominal terms

An important conclusion was obtained in the previous section: if the market value of financial assets is equal to the book value of the obligations securing these assets, then the values of total wealth and of total nonfinancial assets are also equal automatically; that is, the law of conservation of wealth is valid in nominal terms. And vice versa: the mentioned law of conservation is nominally violated if the values of financial assets and the corresponding obligations are not equal. These two scenarios will be considered separately. In this section, we examine the case when the conservation law is satisfied in nominal terms, that is, the values of financial assets and of the obligations securing them are equal. The maintaining of this equality is especially crucial with respect to corporate property rights, in the next section we will show this. Then we will consider equities as the financial assets in this section; the shareholder value of corporations will be assumed to be equal to their own capital.
Such equality may seem implausible today, but it was observed as a whole not so long ago - about 100 years ago and earlier. During such "archaic" period, financial assets performed, as a rule, their natural function: they testified to the ownership and loan relations. Owners of shares of commercial enterprises expected to receive an adequate income in the form of a distributed part of the profit (dividends). Purchase and sale of these shares was made in the event of a real change in the ownership structure of the enterprise, and not for the purpose of obtaining speculative profit due to the growth of their market value. The first stock exchanges traded

[6] The own capital of business entities should not be in the equity section of the consolidated balance sheet to avoid the total wealth overstating due to double counting. The equity of national economy (wealth) is the aggregate own capital of ultimate owners (households), for more details see Appendix A.

mostly government debt securities, and speculative stock trading had insignificant volumes.[7] It is reasonable to determine the market value of an enterprise (shareholder value for a corporation) by using the cost method in the absence of modern developed stock markets in such an archaic economy; the value of a noncorporate business is still determined in this way. Such valuation of business usually involves the appraisal of its net assets' market value. This value is also called the replacement cost. In other words: how much should you spend to create the same exact enterprise? If the evaluated enterprise accounting is properly managed, then its assets and liabilities are reflected in its balance sheet at market value. Therefore the market value of the net assets of this enterprise (that is, the value of the enterprise, determined by the cost method) is equal to its own capital automatically. Thus, the use of the cost method of valuation ensures the originally assumed equality between the values of financial assets (the shareholder value of corporation in our case) and of the corresponding obligations (corporate equity).

The law of conservation of wealth in our archaic economy is true not only for a static situation, but also in the case when the accumulation of capital takes place. Below we demonstrate that the fundamental reason for such accumulation is located in the real sector of the economy. Capital is accumulated due to the not consumed part of the newly created value added, in other words, thanks to capital investment in the real sector. This corresponds to the classical approach to the accumulation of capital. Such process implies simultaneous growth of both national wealth and the total value of nonfinancial assets.

The term "value added" became commonly used after the introduction of the tax with the same name in the middle of the XX century in France. Here this term is used in the conventional sense. Value added is the part of the cost of produced/sold products that was generated in excess of the purchased semi-finished products, raw materials, energy and other previously produced goods and services, which were expended in the production process.

The total (gross) value added created by the economy during the reporting period forms the gross domestic product (GDP). Value added is created through the use of productive resources (labor and capital). Simultaneously with the advent of value added, the same amount of income arises from the owners of productive resources (households and enterprises). Thus, value added simultaneously reflected both in the aggregate product and in the national income. GDP must be equal to the total (gross) income by virtue of the accounting identity between total income and expenses.

In fact, the national income (which is equal to GDP) is the gross revenues in the "income statement" of the entire economy, which is considered as a single consolidated enterprise. And what are the expenses in this statement?

The creation of value added works towards increasing total nonfinancial assets. However the creation of value added is only one side of the economic process. Part of the available assets is consumed and ceases to exist during the reporting period. Enterprises consume part of the employed capital as a result of their productive activities (depreciation). Similarly, consumption of goods and services is necessary to ensure the livelihoods of households.[8] Consumption of previously created value added by enterprises and households reduces total value of nonfinancial assets. The non-consumed portion of the value added of the entire economy is the source of an increase both of its wealth and of total nonfinancial assets. Really, on the one hand, the growth of wealth is embodied in net investment that increases the volume of nonfinancial assets.

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[7] Of course, a speculation in securities and financial bubbles also took place in the "archaic" time, for example, the John Law's "Company of the Indies". But the scale of this activity was not so great and did not significantly affect the real sector of the economy. The danger of volatility of market prices of shares became understandable after the Great Depression of 1929, which began with the collapse of prices on the stock exchange.

[8] The consumed value is not necessarily the newly created materialized added value. It is more accurate to present the process in two stages: as the accumulation initial stocks and value added, and then the consumption of part of the total assets. Nevertheless, mathematically the result is the same.

Investment include: purchase of equipment, increase in inventories, purchase of new real estate, construction of palaces and pyramids. On the other hand, the not consumed value added corresponds to the amount of income not spent on consumption, that is to the savings that increase own capital. The equality between total savings and investments is obvious in this case, it follows from the accounting identity of total income and expenses, both Smith (1776) and Keynes (1936) agreed with this statement.

Running a little ahead, we note that the aforementioned "obvious" equality between total income and expenses (and, thereafter, between savings and capital investment) is performed automatically only if our law of conservation of wealth is observed (aggregate wealth is equal to the total value of nonfinancial assets). In this case the value of total income is equal to gross national income, and the value of total expenditures is equal to GDP. Both of these values correspond to the gross value added, and therefore are automatically equal to each other. Accordingly, savings (income minus consumption) are also automatically equal to investments (expenses minus consumption).

However, in the presence of developed stock markets our law of conservation of wealth can be violated in nominal terms due to inconsistencies between the values of financial assets and their obligations. In this case the total income should increase by the value of unsecured income which corresponds to the unsecured increase in the value of financial assets. Then the equality between aggregate savings and capital investment should be violated also. Such a scenario is described in more detail in Section 5.

Let us first illustrate the dynamics of capital accumulation using the double entry accounting method on the example of one single enterprise, and then extrapolate the result to the entire economy. The growth of net assets at a glance contradicts the principle of double entry. Indeed, if this principle is analogous to the laws of conservation, that is, nothing arises from nowhere, it is unclear, due to what the amount of nonfinancial assets and equity may increase?

The company's own capital (equity) changes, as a rule, as a result of its profits or losses. This process is also recorded by the principals of double entry. The company's equity increases simultaneously with its net assets, and by the same amount, according to the accounting equation. It is important to note that if the profit is received in the real sector of the economy, then the value of total nonfinancial assets simultaneously increases. This is clear from the example below.

How the profit emerges in the real sector and how it is represented by the accounting entries can be illustrated by considering our counterpart supplier B from the example above in Section 2. Supplier B sold the goods to the buyer – company A for $2500. The sale of goods is associated with income (sales value) and expenses (cost of sales). Initially, the monetary value of the goods in the balance sheet of the supplier B is equal to its cost of production (or purchasing), which, generally speaking, does not coincide with the selling price. Let the cost (book value) of these goods is $2000 in the present case. The difference between the sales value and the cost of sales ($2500 - $2000 = $500) is a profit.[9]

In the bookkeeping system of the supplier B:

Income: Sale of goods worth $2500 is recorded simultaneously as a debit to the account "Accounts receivable", and for the same amount – as a credit to the account "Sales".

Supplier B:

Account Debit	Account Credit	Sum
Accounts receivable	Sales	$2500

[9] The profit of a really functioning enterprise is formed in a more complicated manner, which is based on the results of economic activity in the reporting period, taking into account the indirect costs of this period. Our simplified consideration of this issue does not detract from the generality. The essence of the emergency of the profit does not change.

Costs: The book value of the shipped goods ($2000) is the cost of their sale. This is recorded as a credit to “Goods” account and a debit to the "Cost of goods sold".
Supplier B:

Account Debit	Account Credit	Sum
Cost of goods sold	Goods	$2000

Profit, which is the difference between income and costs, is formed on a special account "Profit and loss". Income and expenses are transferred to the “Profit and loss” account. Income is recorded as a debit to this account, cost of sales – as a credit. The difference between these two values is transferred to the equity (capital) account “Retained earnings”.
Supplier B:

Account Debit	Account Credit	Sum
Sales	Profit and loss	$2500
Profit and loss	Cost of goods sold	$2000
Profit and loss	Retained earnings	$500

The balances of accounts “Sales”, “Cost of goods sold”, “Profit and loss” should be zero, as a result. The resulting profit ($ 500) increases the credit balance of the capital account “Retained earnings” (i.e. increases its credit balance). This means that the equity of the supplier B increases by the amount of profit. The increase of the equity on the right (financing) side of the balance sheet compensates for the growth of assets’ value on the left side; in other words it is the source of such growth. The equality of total assets and obligations (liabilities and equity) remains.
The example above shows the double-entry bookkeeping mechanism for making a profit. Company A accepts an acquisition of the goods at a market price that exceeds their production cost for the supplier B. The difference is the profit which is created by company B. If we consider both companies A and B jointly, it turns out that the shipped goods at the time of sale increased their value. This may seem strange at first sight. However the goods really should "rise in value" during the sale in the capitalist economy, otherwise business activity of the company B does not make sense; the capital invested in production will not yield a return. Indeed, the same goods have different prices in the manufacturer's warehouse and on the shelf in supermarket. Thus, if you consolidate the balances of companies A and B before and after the sale, then upon realization both equity and the total amount of nonfinancial assets of united enterprise will grow.
Let us extrapolate the consequences of the economic transaction to the whole economy. We will illustrate the impact on the size of aggregate wealth of the profit of an individual enterprise in the real sector. The hypothetical simplified economy is considered for this purpose consisting of several entities. Their participation is minimally necessary for realization of operation of purchase and sale of the goods described above. The economy consists of 2 nonfinancial enterprises (A and B), of a bank and households. All participants have nonfinancial assets; enterprise A has $2500 cash due to the bank loan received. Table 1 below shows the initial (before the sale/purchase transaction) aggregated balance of our hypothetical economy.

Table 1 Aggregated balance sheet of the economy (initial)

Entity	Assets		Financing	
	Asset name	Sum	Liability or equity	Sum

Enterprise A	Cash	$2500	Bank loan received	$2500
	Nonfinancial assets	$10000	Enterprise A share capital	$10000
Enterprise B	Nonfinancial assets	$10000	Enterprise B share capital	$10000
Bank	Loans issued	$2500	Deposits	$2500
	Nonfinancial assets	$10000	Bank share capital	$10000
Households	Enterprise A shares	$10000	Own capital (wealth)	$50000
	Enterprise B shares	$10000		
	Bank shares	$10000		
	Nonfinancial assets	$20000		

We believe here, without disrupting the generality of the examination, that all enterprises have a corporate form of ownership. We assume for simplicity, that the initial net worth of enterprises is equal to its share capital, that is, to the cost of the initial placement of the issued shares (undistributed profit is absent for now). The own capital of each of the enterprises is equal to its net assets in accordance with the accounting equation. This is also true for households that are the ultimate owners of property rights for businesses. In our case, the evidence of ownership of the enterprise is its equities. The cost of an enterprise's shares in the assets of its holders (households) is the value of an enterprise, which is determined here by the cost method.

According to this method, the value of an enterprise is equal to the value of its own capital, which in turn can be calculated as its net assets. We believe that accounting is conducted in good faith, with the observance of the principle of caution, or prudence concept. Therefore, the overstating of the value of assets on the company's balance sheet it is not allowed; and then the value of its own capital is reliably secured. Thus the value of ownership of enterprise A (the value of shares of enterprise A in the assets of the household balance) is equal to the company's own capital ($ 10000), in accordance with the cost approach; similarly, for the enterprise B. Note that in this case, when applying the cost approach, the value of financial assets (shares) coincides with the value of the corresponding obligations (equity which is equal to the net assets) of the issuer. Therefore the aggregate own capital of households (national wealth) is equal to the total nonfinancial assets, in accordance with the conclusion obtained at the end of the previous section. Table 1 does demonstrate such equality. The own capital of households, in the absence of obligations in this case, is equal to the total value of their assets, namely the amount of ownership (shares) in all enterprises plus the value of their own nonfinancial assets. It is equal to $50000. The total value of nonfinancial assets has the same amount.

The same conclusion can be reached if eliminate internal payables and receivables between entities in our economy (debts to oneself) in the initial aggregated balance sheet (consolidate it), as described in Appendix A:

Table 1.0 Consolidated balance sheet of the economy (initial)

Assets		Financing	
Asset name	Sum	Equity	Sum
Nonfinancial assets	$50000	Wealth	$50000

Let us consider how the aggregated balance of our economy will change after the sale/purchase transaction is made. Enterprise A has purchased goods worth $ 2500, having paid in cash. The cash account has been credited (decreased) and the inventory account has been debited (increase of nonfinancial assets) in the assets of its balance sheet. Enterprise B sold these goods and earned a profit of $500, since the cost price amounted only $2000. We assume that dividends have not been paid, and profits remain at the disposal of the enterprise. We have shown in detail how this transaction is reflected in the accounting systems of both enterprises, using the double entry method. As a result of the transaction, the aggregated balance sheet of our economy will change:

Table 1.1 Aggregated balance sheet of the economy (after sale/purchase transaction)

Entity	Assets		Financing	
	Asset name	Sum	Liability or equity	Sum
Enterprise A	Nonfinancial assets	$12500	Bank loan received	$2500
			Enterprise A share capital	$10000
Enterprise B	Cash	$2500	Retained earnings	$500
	Nonfinancial assets	$8000	Enterprise B share capital	$10000
Bank	Loans issued	$2500	Deposits	$2500
	Nonfinancial assets	$10000	Bank share capital	$10000
Households	Enterprise A shares	$10000	Own capital (wealth)	$50500
	Enterprise B shares	$10500		
	Bank shares	$10000		
	Nonfinancial assets	$20000		

We continue to believe that the value of ownership of an enterprise is tightly linked to the value of its own capital, in accordance with the cost approach. Own capital of enterprise B grew by $500 due to the profit obtained. Hence, the same amount will increase the enterprise worth (its equities) in the household assets, and then it will be $10500. Consequently, the own capital of households (national wealth) will also increase by $500, up to $50500. After the transaction, the value of financial assets is equal to the value of their corresponding obligations, and the wealth is equal to the total value of nonfinancial assets, as well as in the initial balance sheet. The law of conservation of wealth is continues to be preserved in our archaic economy.

We get an important conclusion: both the aggregate wealth and the total value of nonfinancial assets increase at the expense of the profit in the real sector of economy. In other words, the profit in the real sector is a source of increase of the total nonfinancial assets value and of the wealth.

The complication of the ownership structure does not fundamentally change the situation if the cost approach to assets valuation is still used. Let us introduce in our mini-economy an additional entity: a holding company, with corporate ownership structure. Let ownership on nonfinancial enterprises belong not directly to households, but to a holding company (an

intermediary), which is eventually owned by households. Then the initial aggregated balance sheet can be written:

Table 2 Aggregated balance sheet of the economy (initial), ownership structure is more complicated

Entity	Assets		Financing	
	Asset name	Sum	Liability or equity	Sum
Enterprise A	Cash	$2500	Bank loan received	$2500
	Nonfinancial assets	$10000	Enterprise A share capital	$10000
Enterprise B	Nonfinancial assets	$10000	Enterprise B share capital	$10000
Bank	Loans issued	$2500	Deposits	$2500
	Nonfinancial assets	$10000	Bank share capital	$10000
Holding company	Enterprise A shares	$10000	Holding company's share capital	$20000
	Enterprise B shares	$10000		
Households	Holding company's shares	$20000	Own capital (wealth)	$50000
	Bank shares	$10000		
	Nonfinancial assets	$20000		

The complexity of ownership structure did not change the value of households' own capital.[10]
The shares of a holding company are in the households' assets, instead of shares of nonfinancial enterprises, while the value of shares is the same. Indeed, the value of the holding company's shares is equal to its own capital. And its own capital in turn is equal to the total value of shares of nonfinancial enterprises A and B. The internal payables and receivables in the balance can be eliminated, similar to the balance in Table 1; the resulting consolidated balance sheet obviously will be identical to the balance sheet from Table 1.0.
The fact of the of sale/purchase transaction do not change the picture:

Table 2.1 Aggregated balance sheet of the economy (after sale/purchase transaction), ownership structure is more complicated

Entity	Assets		Financing	
	Asset name	Sum	Liability or equity	Sum
Enterprise A	Nonfinancial assets	$12500	Bank loan received	$2500

[10] It is important that the ownership structure here is not entangled when corporations cross-own each other's shares. An example of such entanglement is discussed in the Appendix B, when the equities of the first enterprise belong to the second one, and the equities of the second enterprise belong to the first one.

			Enterprise A share capital	$10000
Enterprise B	Cash	$2500	Retained earnings	$500
	Nonfinancial assets	$8000	Enterprise B share capital	$10000
Bank	Loans issued	$2500	Deposits	$2500
	Nonfinancial assets	$10000	Bank share capital	$10000
Holding company	Enterprise A shares	$10000	Holding company's share capital	$20000
	Enterprise B shares	$10500	Profit/Revaluation of enterprise B shares	$500
Households	Holding company's shares	$20500	Own capital (wealth)	$50500
	Bank shares	$10000		
	Nonfinancial assets	$20000		

Despite the more complex ownership structure, financial assets in this case are equal with their corresponding financial obligations again, and the wealth is equal to the value of total nonfinancial assets. Indeed, the profit received by the enterprise B increases the total value of nonfinancial assets on the one hand. On the other hand, this profit increases national wealth, as a result of the sequence: First, the own capital of enterprise B grows; then, the enterprise B worth increases; as a result, the value of its shares goes up in the balance sheet of the holding company; hence the own capital of the holding company expands; then the value of its shares in the balance sheet of households grows; finally, the own capital of households (national wealth) increases. The law of conservation of wealth is preserved again.

Nevertheless, the business results for an economy with a complicated ownership structure, shown in Table 2.1, differ slightly from the results shown in Table 1.1. Analysis of these differences will allow us to better understand the mechanism of capital accumulation (both nonfinancial and wealth). It turns out that in this process the role of profit generated in the real sector of the economy is fundamentally different from the role of financial profit.

Let's pay attention to the second item in equity of the holding company in the Table 2.1 (Profit/Revaluation of enterprise B shares) in the amount of $500. This value reflects profit (more precisely, an increase in equity) of a holding company, which is a consequence of an expansion in the value of shares of enterprise B in the company's assets. Note that this profit is absent in Table 1.1. That is, while the complication of the ownership structure, one of the subjects of the economy (the holding company) additionally has received a profit, which increased its own capital. Intuitively, it seems that this should increase total income and total wealth. However this does not happen: total wealth in an economy with a complicated ownership structure has not grown. Why? What is the difference between the profit received by the holding company and the profit obtained directly by enterprise B?

The fundamental reason for this difference is that the enterprise B operates in the real sector of the economy, while the holding company - in the financial sector. Profit in the financial sector of the economy implies the growth only of total financial assets. Profit in the real sector is necessarily accompanied by an increase in total nonfinancial assets value. After all, profit in the real sector refers to the value added (its "capital" component). Namely, the total value of

nonfinancial assets and real wealth grows due to the newly created value added (more precisely, due to it's not consumed part).
So, the financial profit (in our example, this is the revaluation of the shares of enterprise B, which are owned by the holding company) has no direct relation to the processes of creating value added in the real sector. Therefore, the financial income of enterprises should not be added to the aggregate income. This view was also shared by the designers of the systems of national accounts including GDP and national income.[11]
Note that in the archaic economy considered in this section, the financial profit (increase in obligations on the right side of the balance sheet) strictly corresponds to the growth of the corresponding financial assets on the left side of the balance sheet. In particular, the financial profit of a holding company ($ 500), which we examined in Table 2.1, is accompanied by an increase in the same amount of shareholder value of this company. That is, the increase in the value of the financial asset (shares of the holding company) is secured by the increase in the equity capital of this company. Thanks to this conformity, the law of conservation of wealth is not violated in our archaic economy.
However, if the value of financial assets is determined in modern financial markets, then a change in this value may not be secured by a change in the corresponding obligations. Then the law of conservation of wealth can be violated in nominal terms; such situation is discussed in the next sections.

4. Pricing of financial assets in modern financial markets. Income valuation method

The mechanism of market pricing for shares and bonds is considered in this section for the modern highly liquid stock market. It is shown here that under certain circumstances, the price of shares may be unstable and can grow unreasonably, forming financial bubbles.
The market value of the financial assets in the case under consideration is no longer strictly related to the value of the corresponding obligations in the issuer's balance sheet. Therefore the cost method of financial assets' valuation is not applicable here.
Really, in a number of cases the cost approach is unacceptable for calculating the value of assets. This concerns, for example, the value of land and natural resources. These assets initially are not related with any costs, and therefore their valuation is impossible by the cost approach. Thus, their market value can be determined only by the using of income valuation method. Similarly, the value of financial assets is usually measured by the same methodology.
The core of the income method is as follows: an asset which generates a known profit should worth the same as any other asset with the same reliability generating an equivalent profit. For example, let the market yield is 3% per annum. This means that capital or financial investments in highly reliable assets of $ 1,000,000 bring the owner $ 30,000 of net profit annually. Then the value of land that brings an owner a rent of $ 30,000 also must amount $ 1,000,000 in accordance with the income valuation method.
The income approach, in turn, is divided into two types: the capitalization of income method and discounting cash flow method. This division is not a consequence of the different logic of valuation; these two methods are applied to different variations of input information. If we know exactly the future cash flows, that is, the benefits that we are going to gain from owning some asset, then the present value of this asset is calculated as the discounted amount of the future flows:

$$P = \sum_{t=1}^{T} E_t \Big/ (1+i)^t \qquad (1)$$

[11] A certain part of the profits of financial institutions still has to do with the real sector and should be taken into account in the national income; this is for example the profit associated with the provision of services by banks for lending and money circulation to the real sector.

where T is the number of future periods during which the benefit is planned to receive; E_t - the size of the benefit (or cash flow) in the period t; i - discount rate. The discount rate may vary for different assets, for example due to a different risk levels. We consider (for simplicity) all assets under consideration to be equal in terms of safety (i.e., the capital market is perfect), then $i = \bar{r}^e$ where $\bar{r}^e$ is the expected average rate of return in the long run future (we will mark the expected values with the superscript e; the bar above the variable means its averaging).

The simplest example is the valuation of discount bonds, under which the holders are expected to receive a cash flow in the amount of the nominal value of P_N after a period of time T, at the maturity date. In this case, Equation (1) will be simplified:

$$P = P_N/(1+\bar{r}^e)^T \tag{2}$$

The discounting cash flow valuation method is considered as the most accurate, and therefore takes precedence. However, if the future cash flows in the long run are unknown precisely, then this method is not applicable. Then the capitalization of income method can be used. The use of this method suggests that the earnings (cash flow) E received (or planned to be received) can be extrapolated for an arbitrarily long period. Then Equation (1) can be rewritten:

$$P = \int_0^\infty E/(1+\bar{r}^e)^t\,dt = E\int_0^\infty \exp(-tLn(1+\bar{r}^e)dt = E\int_0^\infty \exp(-\bar{r}^e t)dt = E/\bar{r}^e$$

The resulting formula for asset valuation by the method of capitalization of income is:

$$P = E/\bar{r}^e \tag{3}$$

The derivation of Equation (3) from Equation (1) demonstrates that both types of the income asset valuation method (both the discounting cash flows method and the capitalization of income method) have the same nature.

We can also illustrate the difference between the cost approach and income asset valuation approach by using the last equation. The equation connects the three variables: the earnings E from the ownership of the asset, the value of the asset P, and the expected average rate of return $\bar{r}^e$.

A similar relationship allows us to calculate the actual asset's yield r, knowing the resulting earnings E and the value of the asset P, which is measured by cost method:

$$r = E/P \tag{3a}$$

Thus, the difference between the cost and income approaches is only in the choice: which of the two values (P or r) is considered to be predetermined? The cost approach implies that the value of the financial asset P is determined by the appropriate "source" on the financing side in the balance sheet of the issuer of this asset (replacement cost, amount of corresponding liabilities or equity), while its rate of return r is calculated. Income approach, on the contrary, implies that the expected in the long term average market rate of return $\bar{r}^e$ is known, and then the value P of the asset is calculated.

A mathematical model of the financial assets valuation by the income capitalization method is presented below. We will consider dividend-paying shares as a financial asset. Let us write a number of the generally accepted formulas.

The rate of return of shares at the end of the period t is defined as the ratio of the earnings (the sum of dividends D_t and of the increment of the share price, $P_t - P_{t-1}$) to the initial price of the share:

$$r_t = (D_t + P_t - P_{t-1})/P_{t-1} \tag{4}$$

The shares' yield in the next period of time $T+1$ (which follows the current period T) is unknown exactly. Nevertheless, we can try to determine its expected value, based on the available data for the previous periods of time. The expected rate of return is usually calculated as the average over several (N) previous periods:

$$r^e_{T+1} = \sum_{t=T-N+1}^{T} r_t \Big/ N \tag{5}$$

The expected in the next time $T+1$ period earnings E^e_{T+1} can be calculated as the product of the price P_T of the shares in the current period T and the expected yield r^e_{T+1} of these shares in the future period

$$E^e_{T+1} = r^e_{T+1} P_T \tag{6}$$

We now calculate the price P^e_{T+1} of the financial asset in question expected in a future period $T+1$. To do this, substitute the expected income in the next period E^e_{T+1} in equation 3.

$$P^e_{T+1} = E^e_{T+1} / \bar{r}^e \tag{7}$$

It should be noted that the expected and actual yields r^e_{T+1} and r_t, calculated according to equations 5 and 6, can vary for different assets in different periods; but these changes do not directly affect the exogenously given value of the expected in the long run average rate of return $\bar{r}^e$, which appears in equations 2, 3 and 7.

Next, we will justify the assumption that we subsequently will use: the actual price of a share in the next period will be equal to the expected one calculated using equation (7):[12]

$$P_{T+1} = P^e_{T+1} \tag{8}$$

Only if this condition is met, the equilibrium state is possible, when the profit of the corporation and the price of its shares are constant. It will be shown below by the method of mathematical induction.

Lemma 1: Let the profit and the price of the shares (D_0 and P_0 respectively) to be unchanged in all previous periods, up to T. Then the price of these shares will not change in the next period $T+1$ if and only if Equation (8) holds.

Suppose that in all previous N periods satisfying condition $T-N+1 \le t \le T$ equations are met:

$$D_t = constant \equiv D_0$$

$$P_t = constant \equiv P_0$$

We assume that the profit received by the corporation in the period t is fully distributed as dividends D_t. Then, according to Equation (4), the actual yield of the shares in any period t ($T-N+1 \le t \le T$) is also constant. Moreover, in our long-term stationary case, it should be equal to the average market rate of return r_0 due to the market mechanisms (for the equilibrium scenario the letter e is added to the number of the corresponding equation):

$$r_t = (D_0 + P_t - P_{t-1})/P_{t-1} = D_0 / P_0 = constant = r_0 \tag{4e}$$

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[12] The actual price of shares P_{T+1} which is measured at the end of the $T+1$ period is not affected by the actual profit and dividends of the corporation in this period, because their values are still unknown at the moment of valuation.

Indeed, if the equilibrium yield D_0/P_0 of the shares would differ from the average market value of r_0, it should inevitably shift the demand for these shares, which would lead to a change in their price and a violation of stationary.
Then the expected yield r^e_{T+1} in the period $T+1$ will also be equal to the average market value

$$r^e_{T+1} = \sum_{t=T-N+1}^{T} r_t \Big/ N = r_0 \qquad (5e)$$

Consequently, the value of the expected income in the period $T+1$ according to Equation (6) will correspond to the stationary value D_0:

$$E^e_{T+1} = r^e_{T+1} P_T = r_0 P_0 = D_0 \qquad (6e)$$

It is logical to assume that the participants of the stock market will expect the same yield also in the future, $\bar{r}^e = r_0$. Therefore, the share price expected in the period $T+1$ according to Equation (7) will be

$$P^e_{T+1} = E^e_{T+1} / \bar{r}^e = r_0 P_0 / r_0 = P_0 \qquad (7e)$$

Obviously, the value of the shares in the period $T+1$ will remain unchanged (equal to P_0) only if it will be equal to the expected value obtained in equation (7*e*). In other words, this requires equation (8) to be fulfilled, $P_{T+1} = P^e_{T+1}$. Only in this case the stationary state observed up to the current period T would be observed for the next period $T+1$.
Similar statements can be obtained step by step with respect to subsequent periods, $T+2$ and further. Thus, the fulfillment of equation (8) is really necessary for the stationary state under consideration to be the equilibrium one. ■
However, this equilibrium is not robust. It turns out that the market price of shares may be unstable when two conditions are met simultaneously: first - the expected price of the security is determined by the capitalization of income method; the second - the changes in the price of this security are included in the earnings of its owner. We will show below that in this case there is a positive feedback while valuation, which cause the price instability.
Let us consider a random deviation from the equilibrium stationary state. Suppose that in the example under consideration there was a random one-time increase in the profit of the company in the period $T+1$, which was not repeated in subsequent periods. Then the amount of dividends accrued in this period will increase, $D_{T+1}=D_0+\Delta D$. Profit and dividends are calculated after the moment the reporting period has been ended. Therefore, the price of shares at the end of this period not have time to change, $P_{T+1}=P_0$; this is a consequence of our assumption formalized in Equation (8). It means that the actual earnings of shareholders in the period $T+1$ will grow only by the amount of dividend growth ΔD:

$$E_{T+1} = D_{T+1} = D_0 + \Delta D$$

The actual yield in this period will be, in accordance with Equation (4) (for the non-equilibrium scenario the letter *n* is added to the number of the corresponding equation):

$$r_{T+1} = D_{T+1} / P_0 = (D_0 + \Delta D)/P_0 = r_0 + \Delta D/P_0 \qquad (4n)$$

Then, the expected rate of return in the period $T+2$ will increase, according to Equation (5):

$$r^e_{T+2} = r_0 + \Delta D/(NP_0) \qquad (5n)$$

And the expected earnings in this period will be, according to Equation (6):

$$E^e_{T+2} = r^e_{T+2} P_{T+1} \qquad (6n)$$

Therefore the expected market price of the security will be equal, according to Equation (7):

$$\begin{aligned} P^e_{T+2} &= E^e_{T+2} / r_0 = r^e_{T+2} P_{T+1} / r_0 = [r_0 + \Delta D/(NP_0)] P_{T+1} / r_0 = \\ &= P_{T+1} + \Delta D/(Nr_0)(P_{T+1}/P_0) = \left| P_{T+1} = P_0 \right| = P_{T+1} + \Delta D/(Nr_0) \end{aligned} \qquad (7n)$$

We believe that the expectations were justified, and the price of shares in the period $T+2$ really increased up to the calculated level

$$P_{T+2} = P^e_{T+2} = P_{T+1} + \Delta D/(Nr_0) \qquad (8n)$$

The actual earnings of the shareholders in this period will be

$$E_{T+2} = D_{T+2} + P_{T+2} - P_{T+1} = D_{T+2} + P_{T+1} + \Delta D/(Nr_0) - P_{T+1} = D_{T+2} + \Delta D/(Nr_0)$$

It is appropriate to assume that $Nr_0 < 1$. Really, if $r_0 = 0.03$ per year, then the assumption of the number of averaging periods $N < 33$ looks quite believable (the value of N is a measure of conservatism of calculating the expected yield). Therefore

$$\Delta D/(Nr_0) > \Delta D$$

And even if the profit and dividends in the period $T+2$ return to the equilibrium level, $D_{T+2} = D_0$, then

$$E_{T+2} = D_0 + \Delta D/(Nr_0) > D_0 + \Delta D = E_{T+1}$$

Thus, despite the fact that the corporate profit has decreased in the period of $T+2$, the total earnings of the shareholders in this period will still grow, due to the growth of the share prices:

$$E_{T+2} > E_{T+1}$$

Obviously, that by making similar calculations we will get an increase in the actual yield r_{T+2} in the period $T+2$ (according to Equation 4). Then, in the period $T+3$ will increase: the expected rate of return r^e_{T+3} (according to Equation 5); the expected revenue E^e_{T+3} (according to Equation 6); and the expected and actual prices of shares P^e_{T+3} and P_{T+3} (according to Equations 7 and 8), that is:

$$P_{T+3} > P_{T+2}$$

Thus, despite the fact that profits and dividends are return to the initial equilibrium level, the price of shares will not cut back to the corresponding level, but will continue to grow. This is due to the existence of a positive feedback. Accidental growth in the earnings of shareholders means an increase in the actual yield of the shares. This, in turn, leads to an increase of the yield and the price of these shares which are expected in the future. As a result, the share price really increases, which means further growth of the shareholders' revenue, and so on.... The described mechanism corresponds to the process of creating of financial bubbles and indicates the instability of share price.

As we announced above, the cause of the instability is the simultaneous fulfillment of two conditions:

(i) The value of security is calculated in accordance with the capitalization of income method;
(ii) Changes in the price of security are accounted for as a part of the earnings received by its owner, which is used to calculate the yield of this security.

If the both factors are met, then a small random increase in share price leads to an increase in the expected profitability (according to Equations 4 and 5) and income (according to Equation 6); this in turn will lead to further growth in the share price (according to Equations 7 and 8). Easier: the growth of the share's price causes an increase in its profitability, and the growth in yield leads to a further price increase. The circle is closed, positive feedback is evident. The existence of such feedback can be the reason for the volatility and instability of stock prices. Instability is a negative factor. To exclude the possibility of its occurrence, it is necessary to break off the positive feedback. To do this, it suffices to exclude at least one of the above conditions.

A radical measure may be to refuse the income approach (the capitalization of income method) to financial assets valuation. This scenario can exist in the absence of a developed stock market, it was considered in Section 3 above. In this case, the value of a financial asset is rigidly tied to the corresponding liabilities or equity in the issuer's balance sheet. The company's equity at the end of the period is equal to the amount of the equity at the beginning of the period plus retained profit. The equity grows gradually by the amount of profits received in the real sector. The shareholder value is equal to the issuer's own capital in accordance with the cost approach; it also grows slowly. There is no positive feedback in this instance, and there will be no exponent growth of the shareholder value. However it is difficult to cancel completely the stock market in the modern conditions. In addition, the assets exist that can only be estimated by the method of capitalization of income, land for example.

It is also unrealistic not to take into account the income which is connected with the increase in the price of the asset. Furthermore, such income is sometimes difficult to separate from the income that is secured by the obligations of the issuer of the financial asset. For example, the secured part of the change in the value of a discount bond may be related to an increase in the obligations of the issuer of the bond in connection with the accrual of interest income, while another (unsecured) part may be related to the change in the expected market discount rate. The increase of the financial asset value is not always accompanied by a break of the connection with the issuer's obligations. Indeed, if an enterprise has received retained earnings, then the revaluation of its shares is necessary, but their value still may be equal to the issuer's equity, see Table 2.1.

Thus, both conditions (i) and (ii) considered separately have the right to exist. The undesirable consequences (instability of the shares price) may result from their simultaneous use. The most delicate and contradictory place in the closed circle of the positive feedback is the question of whether it is possible to use the income received from the asset revaluation to calculate the future value of this asset by the capitalization of income method. This method is described by Equation (3). This equation involves an assumption that the expected income would continue for a long period of time. I do not think that we have the reason to make such an assumption regarding the income received due to the random increase of the value of a financial asset. Such income hardly should be extrapolated to a long-term future. We illustrate these considerations below by the example of discount bonds. The discounting cash flows method is usually used to calculate their price, see Equation (2).

Let the enterprise purchase discount bonds with a face value of $ 1000 with a yield of 3% per annum with a maturity of 10 years. The bonds market value at the time of acquisition in the example above is P_1= \$1000/(1+0.03)^{10} =\$744,1. The yield is determined by the discount rate, which is equal to the expected in the future market rate of return on reliable assets. Expected rate of return can vary. Suppose that for some (short) period, it decreased by 0.5%. At the same time, the Treasury places a new issue of the same bonds (for 10 years with a face value of $ 1000). Based on the placement results, the yield is fixed at the expected level of 2.5%. Their market value in this case will be P_2 = \$1000/(1+0.025)^{10} =\$781,2. Previously issued bonds belonging to

the enterprise are identical to the bonds of the new issue. It is obvious that the market price of the bonds of the first issue should be equal to the market price of the new issue. That is, the price of the bonds of the first issue should increase. The important point is that the market value of the financial asset (bonds of the first issue) broke its relationship with the issuer's balance sheet. Is this a danger of instability? In the case of bonds and similar assets for which the issuer has fixed his obligations, there is no such a danger (we do not take into account the risks of the issuer's bankruptcy). The market value of an asset can really change. Accordingly, there may be a difference between the value of the financial asset and the issuer's obligation, but this difference is limited:

$$\Delta P = P_N / (1 + \bar{r}_2^e)^N - P_N / (1 + \bar{r}_1^e)^N \approx P_0 \times N \times (\bar{r}_1^e - \bar{r}_2^e) \quad (9)$$

If $(\bar{r}_1^e - \bar{r}_2^e)$ is small, so that $(\bar{r}_1^e - \bar{r}_2^e) \times N << 1$, then the fluctuations in the value of discount bonds and similar financial assets are relatively small. Over the time while approaching maturity, the difference between the market value of the bond and the corresponding liability in the issuer's balance sheet will decrease, and will be reset at the time of repayment. The key point due to which there cannot be instability is that for a bond valuation, only the income guaranteed by the issuer is included in the revenue on such securities, and the profit obtained due to the rise in price of bonds is not included. Such a profit actually takes place. The enterprise from our example, that bought bonds of the first issue, can fix the profit at the moment of the second issue in the amount of 781.2 $ -744.1 $ = 37.1 $, by selling the bonds. Can we expect to receive similar profits in the long term future, and calculate the value of the bond by using Equation (3)? Of course not, because in this case the market value of a bond may well exceed its face value, which is absurd. In the end, no one will come to the idea of buying a discount bond at a price exceeding the repayment price promised by its issuer! However such an absurd situation takes place when trading stocks. Most traders in financial markets are not afraid by the situation when the shareholder value significantly exceeds the own capital of the issuer. And this situation means that the value of a financial asset exceeds the cost of the corresponding obligations in the issuer's financing part of the balance.

Conclusion is: the modern stock market by its nature generates the volatility of prices for financial assets. Serious activity is necessary for restricting financial markets to exclude the instability. More on this thesis and its implications is considered in the next section.

5. Disadvantages of violation of the law of wealth conservation in nominal terms

The central thesis of the present book is the law of conservation of wealth, declaring equality between the aggregate wealth and the total value of nonfinancial assets. In Section 2 a sufficient condition was obtained for its preservation in nominal terms: the law is valid if the value of financial assets is equal to the value of the corresponding obligations securing these assets. At the time of occurrence, financial assets appear simultaneously with the counterpart obligations (liabilities or equity). The value of financial assets at this moment is exactly equal to the value of the respective obligations securing them. In Section 3 a case was considered when such equality has been preserved subsequently, in the absence of developed financial markets. However, the picture can radically change if such markets exist. In this case financial assets are not merely the evidence of economic relations, but are also issued in the form of securities, which are traded without restrictions at such markets. Then these assets can break the connection with their "sources" at the financing side of the issuer’s balance sheet. That is, their market value does not necessarily equal the value of the corresponding obligations. In the balance sheet of the issuer the corresponding liabilities or equity will be reflected at the book value in accordance with the accounting rules. And the value of the emitted security is formed in the stock market. In the previous section the simplified mechanism of financial assets pricing was described for such case. Then the shareholder value may be unstable and get significant changes (growth in the case under consideration) without objective reasons.

This section deals with just such a case of violation of the law of conservation of wealth in nominal terms, when the value of financial assets is no longer strictly connected with the value of obligations securing them in the balance sheets of issuers. For example, a corporation's shareholder value may exceed its own capital, while aggregate wealth exceeds the total value of nonfinancial assets. We justify here the statement about the insecurity of such an excessive increase in wealth (and income); such unsecured growth does not change the real amount of wealth. Therefore, the observed violation of the law of conservation of wealth is only nominal one. The result of such a violation is a potential inflation, inflation of financial bubbles and instability of the whole economy.

Let us illustrate the negative consequences of the mentioned violation of the conservation law on a scale of aggregate economy. As an illustration let us consider the mini-economy, the real sector of which is identical to that described in Sections 3. Its initial state is reflected in the aggregated balance sheet, as shown in Table 1. The Table1a below is equivalent to Table 1.

Table 1a Aggregated balance sheet of the economy (initial)

Entity	Assets		Financing	
	Asset name	Sum	Liability or equity	Sum
Enterprise A	Cash	$2500	Bank loan received	$2500
	Nonfinancial assets	$10000	Enterprise A share capital	$10000
Enterprise B	Nonfinancial assets	$10000	Enterprise B share capital	$10000
Bank	Loans issued	$2500	Deposits	$2500
	Nonfinancial assets	$10000	Bank share capital	$10000
Households	Enterprise A shares	$10000	Own capital (wealth)	$50000
	Enterprise B shares	$10000		
	Bank shares	$10000		
	Nonfinancial assets	$20000		

Let's take into account the consequences of the economic transaction of purchase and sale between enterprises A and B. We assume here the presence of developed stock markets, where the value of shares of enterprises is determined. Therefore, in the case under consideration the consequences of such transaction in the balance sheets of the enterprises will differ from those presented in Table 1.1 in Section 3. The profit received by enterprise B in the real sector will not change. The equity of this enterprise will increase by the same amount. However, the market value of its shares will grow stronger than its equity, due to the optimistic expectations. This circumstance is illustrated in the previous section. The magnitude of the additional increase in the value of the shares, due to their market valuation, is not very important. It is also not very important whether the value of shares owned by households will increase due to their revaluation or due to their profitable resale. According to the valid accounting standards, a security must be reflected in the owner's balance at market value. Let's assume that the market value of the shares of enterprise B grew not by the amount of profits received $500, as in Section 3, but by $1000, up to $11000.

Table 1.1a Aggregated balance sheet of the economy (after sale/purchase transaction)

Entity	Assets		Financing	
	Asset name	Sum	Liability or equity	Sum
Enterprise A	Nonfinancial assets	$12500	Bank loan received	$2500
			Enterprise A share capital	$10000
Enterprise B	Cash	$2500	Retained earnings	$500
	Nonfinancial assets	$8000	Enterprise B share capital	$10000
Bank	Loans issued	$2500	Deposits	$2500
	Nonfinancial assets	$10000	Bank share capital	$10000
Households	Enterprise A shares	$10000	Own capital (wealth)	$51000
	Enterprise B shares	$11000		
	Bank shares	$10000		
	Nonfinancial assets	$20000		

In this case it is impossible to eliminate internal payables and receivables between entities in the consolidated balance sheet, as it was done in Section 3 (see Table 1.0). The market value of the shares of enterprise B is higher than the company's own capital, so the total wealth of $51,000 is not fully secured by the total nonfinancial assets in the amount of $50,500. Our law of conservation of wealth is broken in nominal terms.

The equality between total assets and financing has not been violated, both for individual entities and for the entire economy. The additional unsecured increase in the value of financial assets is offset by the same increase in obligations on the financing side of the balance sheet, in this case - by the financial profits of market participants, obtained from resale and/or revaluation of these assets (shares of enterprise B), and as a result - by the growth of households' equity. The growth of obligations occurs "at the wrong address": not on the financing side of the issuer's balance sheet, but in the balance sheet of the random traders and owners of shares. Furthermore, such unsecured growth of obligations is generated in the financial sector of the economy; it is not connected with the value added which is formed in the real sector.

The growth of financial assets and obligations does not necessarily mean a violation of the equality between aggregate wealth and total nonfinancial assets. If the value of financial assets has not break off its connection with the value of the corresponding liabilities/equity, then the law of conservation of wealth is maintained in nominal terms, see Tables 1.1 and 2.1 in Section 3. Then the question is how the prices of financial assets are formed. If the developed stock market is absent and these prices are formed in accordance with the cost approach, then the equality between the aggregate wealth and the total nonfinancial assets is observed. And if the prices for financial assets are formed in modern financial markets and are no longer tied rigidly to the corresponding liabilities/equity, then this equality may be violated, which is shown in Table 1.1a.

The picture will not change fundamentally for more complicated ownership structure which includes a holding company, as well as in Section 3. In this case, the initial balance sheet will be identical to the balance sheet reflected in Table 2 in Section 3. We will not duplicate it here, but immediately bring the balance sheet after the sale-purchase transaction.

Table 2.1a Aggregated balance sheet of the economy (after sale/purchase transaction), ownership structure is more complicated

Entity	Assets		Financing	
	Asset name		Liability or equity	Sum
Enterprise A	Nonfinancial assets	$12500	Bank loan received	$2500
			Enterprise A share capital	$10000
Enterprise B	Cash	$2500	Retained earnings	$500
	Nonfinancial assets	$8000	Enterprise B share capital	$10000
Bank	Loans issued	$2500	Deposits	$2500
	Nonfinancial assets	$10000	Bank share capital	$10000
Holding company	Enterprise A shares	$10000	Holding company's share capital	$20000
	Enterprise B shares	$11000	Profit/Revaluation of enterprise B shares	$1000
Households	Holding company's shares	$21500	Own capital (wealth)	$51500
	Bank shares	$10000		
	Nonfinancial assets	$20000		

The difference between aggregate wealth and total nonfinancial assets can only increase due to the appearance of the holding company in the case under consideration. The market value of the shares of enterprise B after transaction has grown to $11,000, similar to the case shown in Table 1.1a. Respectively, the value of the assets of the holding company that owns these shares will grow, as well as its equity. Consequently, the market value of the shares of the holding company should also increase, at least by the amount of increase in its own capital to a value of 21000 $, at the expense of the received financial profit/revaluation. However, most likely the market price of shares of the holding company should grow even more, similar to the shares' price of the enterprise B. After all, the price of holding company's shares is also formed in the stock market, which is susceptible to positive expectations associated with the actual increase in profits. Suppose that such additional growth of the shareholder value of a holding company would be $ 500, up to $ 21,500. Aggregate own capital of households (wealth) will eventually grow to $ 51,500. The resulting imbalance between aggregate wealth and the value of total nonfinancial assets will increase additionally (up to $ 1000) through the participation of the holding company. At the same time, the value of total nonfinancial assets after the transaction is the same for all considered cases (Tables 1.1, 2.1, 1.1a, 2.1a).

Let's summarize. We have considered here and in Section 3 the same economic transactions in the real sector of the economy for two different methods of financial assets pricing. In Section 3 we have assumed that the value of the financial assets is determined according to the cost approach in the absence developed financial markets. In this section such markets, determining the value of financial assets, are included in the review. It turns out that the same economic activity in the real sector can cause the different financial consequences, depending on the

applied mechanism of asset pricing. Even the size of the aggregate wealth can change in the economy under consideration, depending on the approach to valuation.

Indeed, the balance sheets reflected in Tables 1.1a and 2.1a in this section show an additional increase in aggregate wealth relative to the wealth reflected in the balance sheets in Tables 1.1 and 2.1 in Section 3. Financial assets have generated additional profit and additional wealth "by themselves", without the involvement of the real sector in the case considered in this section. The aggregate wealth has grown additionally in the balance sheet, but have we become richer in reality? And is not this similar to the alleged "enrichment" of Pinocchio in the Land of Fools?

From our point of view, the growth of the value of financial assets, which results in the deviation of this value from the value of corresponding liabilities/equity in the issuers' balance sheets, is unreasonable and unsecured. In the case under consideration (Table 2.1a), only part of the increment in aggregate wealth (amounting to $500), which corresponds to the profits received in the real sector, is secured by the growth of aggregate nonfinancial assets. The other part of the gain (worth $1000) is not secured; the corresponding financial income is not secured also.

Our reasoning may seem controversial. Growth of shareholder value of corporations is usually considered quite justified, regardless of whether or not there is a corresponding increase in the equity of the issuers. The key here is the question: How much does enterprise B really worth? Is it its shareholder value, formed on the stock exchange according to the income approach ($ 11,000)? Or it is the value of the company's own capital in its balance sheet ($ 10,500), according to the cost approach?

The modern mainstream point of view asserts that the price formed in the stock market is justified. Really, in this case it is determined by market factors based on the demand and supply balance. However, is it always possible to trust such a price?

Sometimes demand is rush. Sometimes entities are subject to "animal spirits" (Keynes, 1936). It was shown in the previous section that the market price of shares may be unstable. The random growth of actually received (or expected) profit leads to an increase in the value of the share, which adds the amount of the revaluation to the shareholder's earnings, which in turn additionally increases the value of the share and so on. Positive feedback and instability occurs. Thus, financial bubbles are formed.

For a better understanding, consider a similar situation in commodity markets. The same instability can arise in the event of an unexpected significant excess of demand for a certain product over its supply, the consequence of which will be a deficit of this product. Naturally, its price should rise. At the same time, there may be panic moods, when most market participants are confident that the deficit trend will continue. They will therefore assume that tomorrow the price will continue to grow. Buyers will try to increase purchases today, thereby increasing demand. Vendors, on the contrary, will hold the goods today, hoping tomorrow to sell them at a higher price; the supply will reduce.

Thus, the behavior of sellers and buyers will contribute to the growth of an unstable trend, but this will take place only in the short term. A significant increase in prices for the commodity in question will encourage its producers to increase output. Of course, this may take some time. In addition, it will be necessary to put into operation additional production capacity to saturate the rush demand, which later (when the boom ends) may be unnecessary. This can lead to overproduction in the industry in future. Therefore, the panic tendencies are quite logically interpreted by society as harmful. For their leveling, reasonable governments have always created stocks of strategically important products: grain, fuel, etc., now this is usually done with the help of state reserve enterprises. As a result, the panic growth in demand for such goods is satisfied without a dramatic price increase, due to available at such enterprises stocks of especially important goods. The price in this case is close to the fair value which corresponds to the economic cost[13] per unit produced by the optimal technology. The reserves in banks, the state

[13] By the term "economic cost" we mean the sum of the cost of production and the normal profit.

gold and foreign exchange reserves perform the same stabilizing role in the banking sector and in the foreign exchange market.

The mechanism of instability in the stock market is similar to such a mechanism in the commodity market described above. Such mechanism is modeled mathematically in the previous section. The expectations of a further rise in price of a certain security create an agiotage demand for it, and lead to a further price increase. We believe that the volatility of share prices in the stock market is unhealthy phenomenon, similar to the commodity market. And that the price of a financial asset should not be very different from economically justified value, which is calculated according to the cost approach.

Economists who adhere to the ideology of the mainstream do not agree with this point of view. They believe that the fair value of an enterprise does not necessarily have to consist only of the value of its own capital. The effect of the "non zero sum", should be taken into account. As a result, an enterprise can cost significantly more, than the value, calculated according to the cost approach. Our opponents argue that intangible assets can have a significant value, such as know-how and so on. They argue that a business can have a synergy effect, and therefore may have a value much higher than the originally investment in the production activity.

This point of view is very common, although not completely logical from our point of view. Suggest that I managed to find a market niche and create an effective enterprise in the real sector of the economy (a start-up) that provides extremely high return on investment. It would seem that I should hold dear this highly profitable business. However if you follow the logic of the mainstream, it turns out that this is not the best option. Indeed, in this case I simply would have significant income from investments in newly created production. At that, I would receive this income only for a limited time, until competitors copied my innovations.[14] It is much more attractive to sell the enterprise immediately. After all, if it generates a return on investments twice as large as the average market rate, the shareholder value of this enterprise, calculated according to the capitalization of income method (see Equation 3), will be 2 times higher than the invested capital. And when selling an enterprise, I will immediately receive 100% of the profit. The amount received is equivalent to the present value of discounted cash flows calculated on the assumption that such a large profit will continue for a very long time. This assumption is doubtful, so it is much more profitable to sell the enterprise, and create a new start-up, twice as much as the previous one. However such an algorithm works only on an impersonal stock market, where not whole enterprises are sold, but their very small parts and "indices". And it does not always work, if a whole particular enterprise is sold. After all, the buyer understands that he can buy a similar set of equipment twice cheaper and lure sales managers together with the clientele.[15] The reasoning justifies the assertion that in the long-term stable perspective, the market value of an enterprise must correspond to the cost of total capital investment in an enterprise that corresponds to a cost approach. Really, if the environment is competitive, the emergence of an industry in which the yield is higher than the market level, at once entails growth in investments in this more profitable sector. Due to this the industry's output should grow and the yield should slowdown to be equal to the market one in the long term.

There may be additional objections from supporters of the mainstream. They argue that there are cases when you cannot earn the same profit by creating a similar enterprise. The reasons are: human capital, unique corporate rules, intellectual property, and so on. As an example, they lead Microsoft, Facebook or something similar. However in the examples given, we can talk not

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[14] Innovations, of course, can be protected by a patent or other barriers, but such restrictions do not correspond to the perfect competition declared by us.

[15] This situation I saw in the early 2000s. The American venture fund has tried to sell a successful business in the production of facing bricks, which has just been organized in Ukraine; the cost of sales was calculated using the income approach and significantly exceeded the fund's investment. The result was not the expensive sale of the existing enterprise, but the cheap creation by the potential buyer of the second same producer, and the growth of competition in the industry.

about some kind of intangible know-how, but about trivial monopolization of the market. If we have a company that has been receiving super profits for a long time, the monopoly is almost certainly involved here. A reasonable state regulates monopoly industries. Natural monopolies (public utilities, for example) have limitations on profitability. The exploitation of natural resources is also usually regulated by the state. In this area, rental payments are introduced to prevent excess profits. If there is no monopoly, then any know-how can be reproduced or copied.
Opponents may have another object. An enterprise, not being a monopolist, can generate more profit on invested capital relative to competitors due to intangible or image advantages. The simplest example is a recognizable brand. With a similar quality it allows you to get more profit compared to competitors who do not have such a brand. According to accounting standards, the value of a trademark or goodwill can be accounted for in the balance sheet as an intangible nonfinancial asset. The source of growth of total nonfinancial assets is the not consumed part of the value added. Within a particular enterprise, this source is the retained profit, it was discussed in Section 3. The aggregate amount of the company's nonfinancial assets is growing smoothly as profits are accumulated. However a brand or goodwill being nonfinancial assets, as a rule, does not have such a source, they appear "out of nowhere". Therefore, it may seem that this example contradicts our accounting logic. The contradiction goes away when you consider that such values as a brand are created in the consumer's head by increased advertising. And it would be more correct not to write off for costs completely the increased expenses of advertising, through which the brand was created, but to consider that expenses, among other things, as investment in the trademark.
Another argument of our opponents in favor of the pricing of the enterprise's value by the income approach can be formulated as follows. The cost of business can be provided not only by the collateral value of its net assets, but also by the generated profit. We do not agree with such approach. The most accurate valuation of the asset that generates revenue is provided by the use of the discounted cash flow method, see Equation 1 in Section 4. Since the cash flows that the business will generate in the future, as a rule, are not known exactly, the method of capitalization of income is used more often in practice, by using Equation 3. The difference between this method and the cost approach can be clearly illustrated as follows. Both own capital and nonfinancial assets in an archaic economy grow smoothly, as the net savings are accumulated, equal to net the investment. Indeed, the most characteristic and traditional epithet for classical understanding for capital is “accumulated”. Capital is accumulated “brick by brick” growing due to savings at the expense of the non-consumed part of the value added (due to profit in our example). If the profit have increased in a certain period for 2 times, then to the total capital will be added to the 2 times larger "brick". However each such brick (even doubled) makes up only a small part of the total capital and does not affect its total value greatly. The method of capitalization of income uses a "lever" - if the earnings has grown 2 times, then the capital has doubled, see Equation 3. However as is clear from the derivation of this equation in Section 4, it gives a discounted amount of future cash flows based on the assumption of the invariability of the income received in the infinite perspective. An endless prospect in such issue is questionable. However, in order for Equation 3 to yield acceptable accuracy, the perspective should still be long enough. The discounted amount of future cash flows for N years, during which the income is unchanged, can be calculated similarly to the derivation of Equation 3.

$$P = \int_0^N E/(1+\bar{r}^e)^t\,dt = E\int_0^N \exp(-tLn(1+\bar{r}^e)dt = E\int_0^N \exp(-\bar{r}^e t)dt = [1-\exp(-\bar{r}^e N)]E/\bar{r}^e$$

The resulting value will be close to calculated by the method of capitalization of income according to Equation 3 if the second exponential term in the resulting formula is negligibly less than 1, $exp(-\bar{r}^e N)<<1$. Then for the plausible expected market rate of return of $\bar{r}^e$ =3%, $N>>33$ must hold. Very few companies have been thriving for such a long time.

One more important consideration exists, which follows from the above arguments. If the shareholder value of the enterprise is revaluated by the capitalization of income method (due to a one-time increased profit, for example), this is a clear violation of the accounting principles, namely the prudence concept. Indeed, it looks fairly imprudent to believe that single-time enlarged profit will persist in a sufficiently long term. And such a belief underlies the capitalization of income method. Therefore we believe that it is doubtful to estimate the value of a corporation by this method.

Note that no one evaluates the noncorporate business by the capitalization of income method; such a business is traditionally estimated using the cost approach. However, should the legal form of business organization influence the method of its valuation, and, consequently, the amount of total wealth? After all, when a private enterprise changes the form of ownership, nothing changes in the real sector of the economy, and the concomitant change in the total wealth is only imaginary and nominal. We therefore believe that the equality of national wealth (the aggregated own capital of households in our case) and the total value of nonfinancial assets is logically justified. Moreover, the compliance with such equality contributes to the sustainability of the economy; this thesis is discussed in detail below.

Another objection to the supporters of the mainstream can appear. Section 4 shows the *possibility* of instability, consisting in a sharp increase in the share price. As a result, the shareholder value of corporations *can* significantly exceed their own capital. However does this really happen? And if so, what is the scale of this discrepancy?

To find out whether such a problem exists across the economy, it is necessary to compare the total equity of corporations with the aggregate market value of their shares. Such a comparison is made below in Figure 1 for the United States.

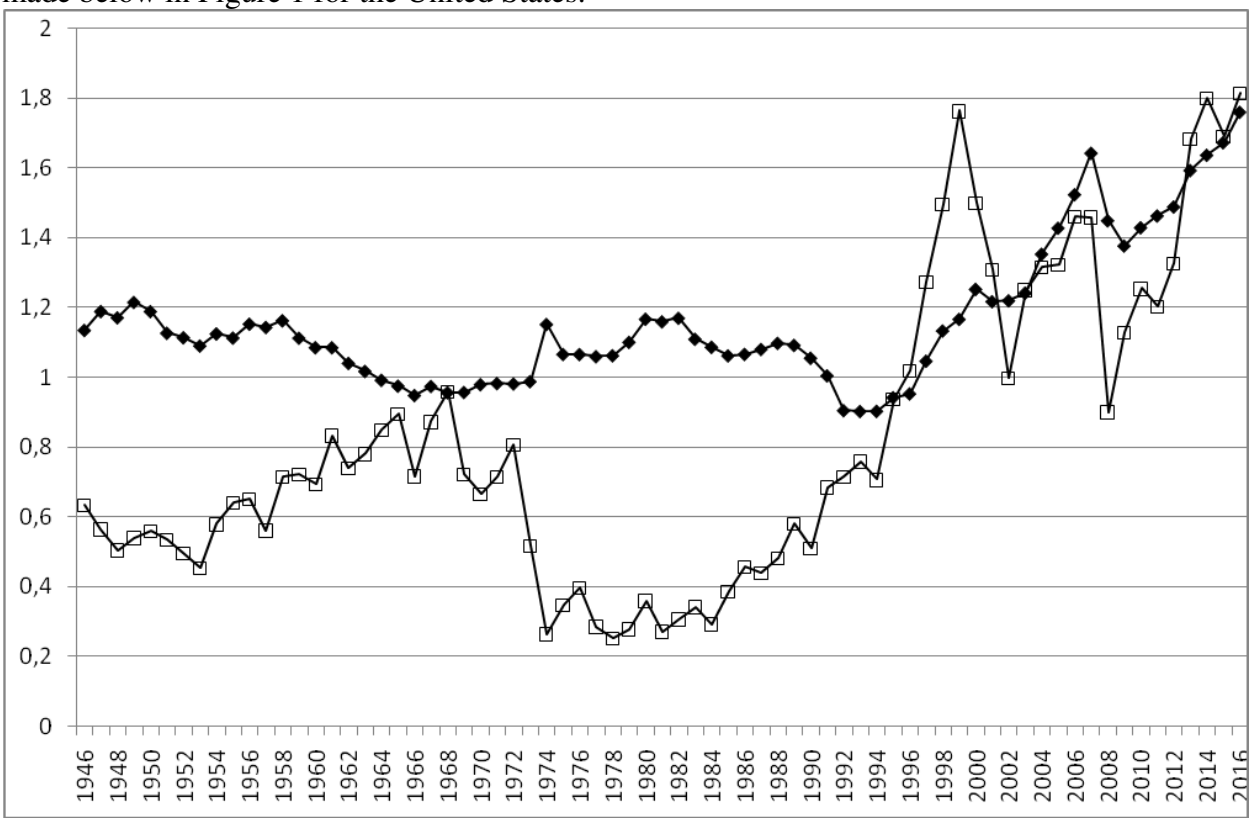

Fig 1 The total value of the US corporations relative to GDP is calculated in two ways: ♦ shows the aggregate net assets of all corporations (equity); □ shows total market shareholder value of all corporations[16].

[16] Both the shareholder value and the own capital are adjusted by the amount of the stocks net issue, see Appendix G "Data Sources".

The figure shows that the discrepancy actually exists between the aggregate shareholder value, which is formed in the stock market, and the total equity of the corporations. This discrepancy has a significant scale and predominantly oscillatory character.

Pseudo-income and pseudo-wealth cannot be accumulated infinitely. The excess value should either be dispersed due to inflation of nonfinancial assets, or be leveled by reducing the market value of overvalued financial assets. Indeed, as a rule, after a rise in stock prices, there is a decline, as shown in Figure 1. However, such fluctuations do not always go smoothly, and may be accompanied by crisis phenomena.

Turning to history, in the early 18th century, John Law founded the financial bubble in France: «Company of the Indies». Share price of this company did not grow at the expense of real profits and of the company's own capital growth, but at the expense of expectations of further price growth. These expectations were fuelled by the advertising company of the organizers and the active buying of shares in the secondary market that they organized by printing paper money. The reason for this happened was the extreme conviction of Law that the key to economic prosperity is the abundance of money in the country (it is strongly associated with the popular quantitative easing policy). His enterprise collapsed, and the consequence was the financial crisis in France. And did not the Great Depression begin with the collapse of the stock market? And now, a significant part of the instability cases and business cycles in the economy are probably the result of price fluctuations in the stock market. Optimism, which is connected with the growth of stock quotes, really can revive aggregate demand for some time, and cause the growth of aggregate output. A person feels richer, because the summary of stock exchanges demonstrates that the paper called "share" belonging to him was more worth in units of "dollar." However such effect has a temporary nature, and has no positive consequences in the long term. A long time ago Keynes (1936) argued: "*When the capital development of a country becomes a by-product of the activities of a casino, the job is likely to be ill-done*." After all, the rise of the stock market, as a rule, should be followed by the opposite trends in the economy. These considerations are confirmed by the data in the figure below.

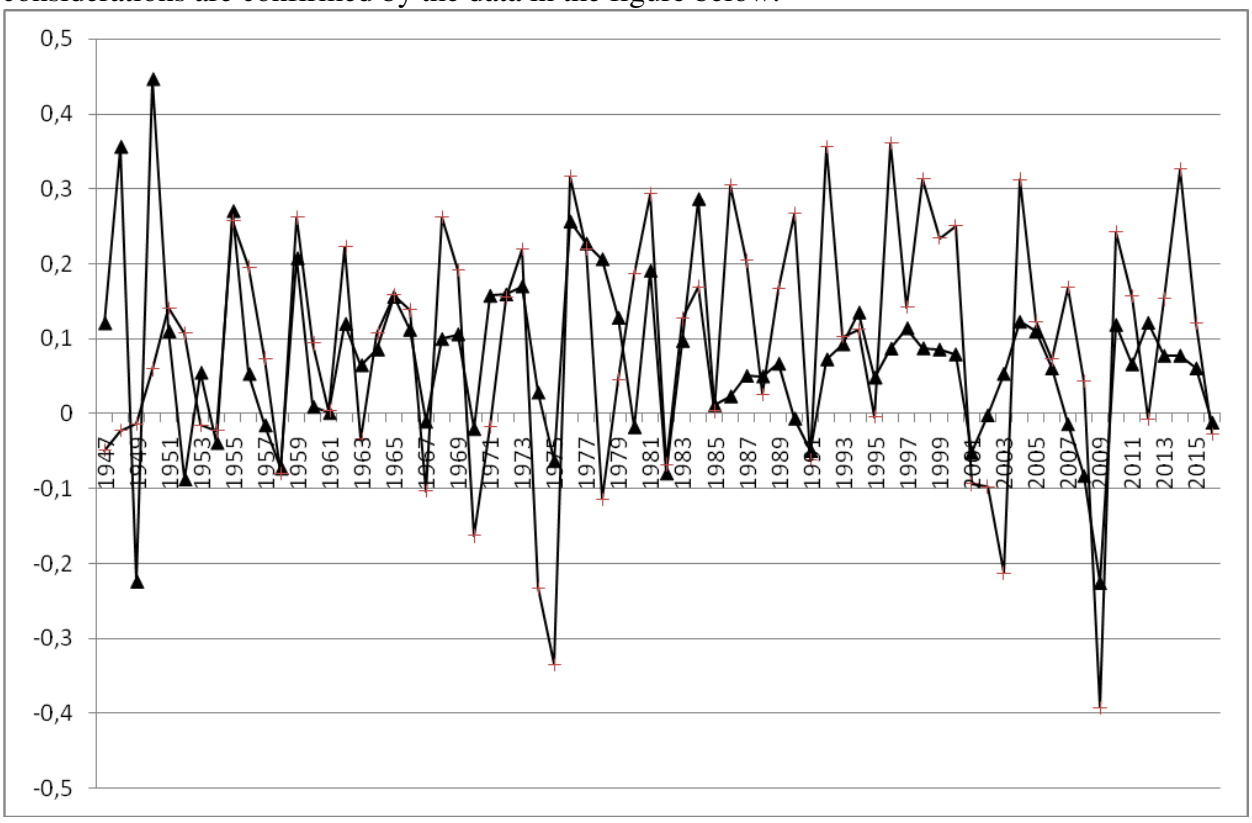

Fig 2 USA. Relative changes of gross private investments (▲) and of shareholder value of nonfinancial corporations, which is shifted (lagged) by a year later (+)[17]

The figure shows a good correlation between the changes in shareholder value (shifted by a year ago) correlates and the changes in gross investment in real sector of economy (the correlation coefficient is greater than 0.5, see Appendix G). Changes in investments, in turn, determine the changes of growth rate of real GDP. Thus, fluctuations in the stock market and volatility of capital investment and of GDP growth rate are linked. The curve of changes in the stock market in the figure is shifted (lagged) by 1 year to the right (later); original (unshifted) time series do not correlate with each other. It means that at first the prices in the stock market will have changed, and only then, after a year, the investments and the growth rate of real GDP will vary. This is a serious argument in favor of the statement, that the fluctuations in the stock market are the cause, while the changes in investment and GDP are a consequence.

The above observations suggest that the modern stock market is the cause of unstable phenomena in the real sector of the economy, by contributing to the appearance of unsecured income and wealth.

Above we touched on the oscillatory cyclic component of the unsecured part of the value of financial assets (and, therefore, of the unsecured wealth), which is characteristic of the value of shares. But another component exists, corresponding to the average value of unsecured wealth, which tends to permanent growth. This conclusion does not follow directly from the analysis of the value of equities; it is a consequence of the analysis of the value of the entire spectrum of financial assets. Below we show that the unsecured component of the value of financial assets is indeed permanently growing, and by 2016 reached at least $ 11 trillion, see Figure 5 in part 8 and Figure F5 in Appendix F. The monotonously increasing average value of unsecured income and wealth should inevitably lead to another negative consequence, in addition to inflating financial bubbles. This is a potential inflation.

If the market value of securities, that are assets to their owners, exceeds the value of corresponding obligations in the issuers' balance sheets (liabilities or equity), this automatically means that the aggregate wealth exceeds the total value of nonfinancial assets. That is, the nominal value of the wealth, which is equal to the aggregate net assets of households in our two-sector economy, should exceed the value of available physical (nonfinancial) assets. And if you try to share these assets at the current prices among households fairly, then they will not be enough. If we denote the total book value of nonfinancial assets as K_n, and the total equity as K_f, then the correction factor k to the nominal value of nonfinancial assets will be equal to

$$k = K_f / K_n \qquad (10)$$

In the case under consideration, $K_f > K_n$, and consequently, $k > 1$. The wealth of households in nominal units K_f exceeds the real (nonfinancial) capital K_n in k times. The coefficient k characterizes hidden (potential) inflation. Thus, the overvaluation of financial assets results in such potential inflation.[18]

This outcome testifies that the law of conservation of wealth is broken only in nominal terms here. The own capital of households in nominal terms grew stronger than the value of nonfinancial assets. However the attendant potential inflation leveled such a faster growth of nominal wealth. Therefore, the law of conservation of wealth is actually fulfilled, if by wealth we mean not its nominal, but its real value. Not all that seems to be income and wealth is such.

6. Formalization of the process of the emergence of unsecured income and wealth

[17] The shareholder value is adjusted by the net issue of stocks, see Appendix G "Data Sources".

[18] Of course, the potential inflation is not necessarily leads to the actual increase in prices; but it prepares the ground for the actual inflation.

In an economy with a developed stock market, which was discussed in the previous section, the value of financial assets may break the link with the value of the obligations securing them. In this case a difference can arise between the aggregate wealth and the total value of nonfinancial assets; we call this difference as unsecured wealth. The aggregate nominal wealth in such an economy can exceed the aggregate wealth in the exactly the same archaic economy in which a modern stock market is absent. The additional increase in wealth cannot occur without an additional increase in household incomes and savings relative to incomes and savings in the archaic version of the economy. We call such additional income, which forms the unsecured wealth, as unsecured also. At the same time, expenditures, including consumption and capital investment, are identical for both economies. The emergence of unsecured income and unsecured wealth can be formalized mathematically; it is shown below in this section.

Nonfinancial capital K_n is a production factor and operates in the real sector of the economy, participating in the creation of the value added. The total amount of net value added is the total net output Y_{net},[19] which is equal to the total income in its traditional interpretation:

$$Y_{net}(t)=C(t)+I_{net}(t)= w(t)N(t)+r_nK_n(t) \quad (11)$$

where r_n is the return on nonfinancial capital, wN is the total employees' wages, C and I_{net} are consumption and net capital investment in the real sector. The formula consists of two parts. The first part of this formula reflects the value of produced consumer and investment goods, $C+I_{net}$ (total value added). The second part of the formula shows the income corresponding to the output of these products, received by owners of production factors (labor and capital), $wN+r_nK_n$. The index n is used to denote the values associated with nonfinancial capital and with the real sector of economy; analogues of these quantities associated with the financial sector are labeled by the index f. Savings in the real sector S_n is the difference between total output (value added) and consumption. It follows directly from equation (11) that this difference is equal to capital investment I_{net}, thanks to which nonfinancial capital is accumulated:

$$S_n(t) =Y_{net}(t) - C(t) = I_{net}(t) \quad (12)$$

Let us consider now the wealth (the own capital of households), which is financial side of the capital. The capital income of each individual household is provided by the own capital of this household, it is easy to show. We assume that capital income is generated by all assets owned by the subject (as a rule, their value exceeds the own capital). However, at the same time the household usually has liabilities, which require the costs of their service. We consider the capital market to be perfect, which means that the profitability of all assets is the same and is equal to the interest that must be paid on existing liabilities. The difference between the value of assets and liabilities is the own capital of the subject. Therefore, in our case the income of the i-th household due to the ownership of assets, less the cost of servicing the liabilities, will be equal to the income that generates the own capital (wealth) K_{fi} of this household. Thus, the income H_i of the i-th household, including labor and capital components, which is spent by consumption and savings, can be written down:

$$H_i(t) = C_i(t)+ S_{fi}(t) =w_i(t)+ r_fK_{fi}(t) \quad (13)$$

where r_f is return on financial assets.[20] Summing up for all households, we get:

$$H(t) = C(t)+ S_f(t) =wN(t)+ r_fK_f(t) \quad (14)$$

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[19] Difference between the net and gross product is depreciation δK_n, where δ is the depreciation coefficient

[20] r_f is the ratio of profit, including revaluation of financial assets, to wealth K_f; the ratio of profit in the real sector of the economy to the total value of non-financial assets K_n is denoted by r_n.

Let us compare the aggregate income in the last equation and in Equation (11). The value of aggregate household income H in equation (14) includes the revaluation of financial assets (capital gains), and therefore may not coincide with total income in the real sector, which is equal to the total net value added Y_{net}, see Equation (11). This fact is known; such household income, taking into account the capital gains, is usually named as Haig–Simons income (Haig, 1921 and Simons, 1938). The difference between aggregate Haig – Simons income and national income in the real sector is precisely what we call the unsecured income, ΔH. By comparing the right parts of equations (11) and (14), we have:

$$\Delta H(t)= H(t)–Y_{net}(t)=[wN(t)+ r_fK_f(t)] – [wN(t)+r_nK_n(t)]= r_fK_f(t) – r_nK_n(t) \quad (15)$$

Equation shows that unsecured income ΔH can arise only if the capital component of Haig-Simons income r_fK_f and capital income in the real sector r_nK_n differ apart. In other words: unsecured income means an excess of the capital income received by the ultimate proprietors (households) compared to the profit received in the real sector of the economy.
Comparison of Equations (11) and (14) can be done in another way:

$$\Delta H(t)= H(t)–Y_{net}(t) =[H(t)–C(t)]–[Y_{net}(t)- C(t)]=S_f(t)–S_n(t)= S_f(t)– I_{net}(t) \quad (16)$$

Unsecured income ΔH is equal to the difference between household savings S_f and savings in the real sector S_n, which in turn equals capital investment. Capital investment I_{net} is a source of accumulation of nonfinancial capital, and household savings S_f are a source of accumulation of their own capital (wealth). In the absence of inflation, this can be described as:[21]

$$dK_n(t)/dt= I_{net}(t) \quad (17)$$

$$dK_f(t)/dt = S_f(t) \quad (18)$$

$$\Delta H(t)= S_f(t)– I_{net}(t)= dK_f(t)/dt – dK_n(t)/dt= d[K_f(t)– K_n(t)]/dt \quad (19)$$

The last equation shows that the difference $S_f–I_{net}$, being an unsecured income, is also a source of accumulation of the unsecured wealth $K_f–K_n$.
Paradoxical conclusion follows from Equations (19) and (16): it is possible the savings to be not equal to the investment, and the total income - to the total expenditures (output); this occurs when unsecured income ΔH is non zero. The reason for this paradox is that when calculating the value of savings S_f, the values of income and expenditures are calculated according to different methods:

$$S_f(t) = H(t) – C(t) \quad (20)$$

The total income H of the ultimate proprietors (households) here is the Haig–Simons income, which includes the capital gains. The total income calculated in this way (Equation 14) differs from the "traditional" national income equal to net value added (Equation 11). In order for savings and investments to match, it is necessary to calculate expenditures according to the same method as the income. The volume of investments should then include an additional amount of savings absorbed by an unsecured increase in the value of financial assets. Today this additional value is often (and in my opinion unreasonably) called as "investment" also. We do not believe that such "investments" are real and that they increase the actual wealth of the nation.

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[21] The dimension of the flow variables (investments, savings, consumption, output) is the cost divided by time, see Appendix C.

It should be noted that the described paradox can take place only simultaneously with a non-observance (in nominal terms) of the law of conservation of wealth formulated above. Wealth is the financial side of capital; it is calculated on the basis of Haig–Simons income. Nonfinancial capital (physical side) is calculated by using the traditional method, based on national income. As long as the law of conservation of wealth is observed, and there is no unsecured wealth, both methods give the same result, as it was observed in the 3rd section when considering the archaic economy. However the values of wealth and nonfinancial capital may differ for an economy with modern financial markets, then the different methods give different amounts of income; this is the nature of this paradox.

Equations (15) and (16) quantitatively describe the unsecured income which is the key concept of our study. These two equations demonstrate two views from different sides on the same event: the emergence of unsecured income (and of unsecured wealth). On the one hand (Equation 15), unsecured income ΔH arises due to "under consumption" when household savings exceed investments in the real sector, $S_f > I_{net}$. Piketty (2014) used this logic to explain faster growth of large fortunes (rich households are not able to completely consume all of their huge income). On the other hand (equation 16), unsecured income arises due to the fact that the capital income of ultimate proprietors exceeds the profit in the real sector, $r_f K_f > r_n K_n$.

Equality $\Delta H = r_f K_f - r_n K_n$ leads to an interesting conclusion. If the returns on financial and nonfinancial assets are equal, $r_f = r_n$, in the presence of unsecured wealth, $K_f > K_n$, then unsecured wealth should grow further, since $r_f K_f > r_n K_n$ will occur, and therefore $\Delta H > 0$.

7. Rising inequality

7.1 Introduction. Rising in wealth inequality

The central theme of this study (the unsecured income and wealth) is closely related to the issue of rising inequality. The increase in inequality appears as otherwise consequence of capitalist's "animal spirits", which aspire to maximize their income and wealth. The topic of inequality includes two interrelated issues: inequality in the distribution of total income between households, and inequality in the amount of their own capital (wealth) accumulated. We believe that when considering rising inequality, the main focus should be on the increase in wealth inequality. After all, when studying the inequality between people, we first of all consider the inequality in their opportunities. And the inequality in opportunities depends not only on income, but also on the stock of own capital of the subjects, that is, on their wealth. In addition, it turns out that the wealth inequality has a decisive impact on the increase in income inequality. At first glance this statement may seem controversial. Indeed, the size of wealth affects only the capital part of income, which is much smaller than the labor component on a scale of whole economy. It seems almost obvious that income inequality is determined primarily by wage inequality. But empirical evidence suggests otherwise.

The capital income share is really lower than the labor income share. Yet, firstly, the capital share has been growing in recent decades due to a decrease in the share of labor income. And, more important for us, it is exactly the capital income (in the upper part of the distribution) that is the factor determining the dynamics of income inequality (declining in the 20th century, until the 1980s, and further growth), see Roine and Waldenström (2014); Facundo et.all (2015); CRS Report for Congress (2011). And another important factor exists, considered by no means all economists: the total income should include revaluation of assets (capital gains), see Roine and Waldenström (2012 & 2014).[22] As a rule, the mentioned revaluation has a purely financial character, and therefore it is not taken into account when calculating the income of real sector in the systems of national accounts, NIPA for example. Nevertheless, the capital gains are completely appreciable part of Haig-Simons income for each specific household, which increases the wealth of this household. We justified above that this kind of income and a

[22] The authors take into account only capital gains "realized" as a financial profit, but we believe that unrealized capital gains also should be considered.

corresponding increase in wealth are unsecured, since they have no roots in the real sector of the economy.

The rising wealth inequality has been comprehensively considered in detail by Piketty (2014) in his famous treatise. The author shows that the observed actual excess of the return on capital over the rate of growth of real output, $r>g$,[23] may be the cause of the rising inequality in the distribution of wealth. Characteristic quotation from Chapter 10 is: «*Consider a world of low growth, on the order of, say, 0.5–1 percent a year, which was the case everywhere before the eighteenth and nineteenth centuries. The rate of return on capital, which is generally on the order of 4 or 5 percent a year, is therefore much higher than the growth rate. Concretely, this means that wealth accumulated in the past is recapitalized much more quickly than the economy grows, even when there is no income from labor. For example, if g = 1% and r = 5%, saving one-fifth of the income from capital* (*while consuming the other four-fifths*) *is enough to ensure that capital inherited from the previous generation grows at the same rate as the economy. If one saves more, because one's fortune is large enough to live well while consuming somewhat less of one's annual rent, then one's fortune will increase more rapidly than the economy, and inequality of wealth will tend to increase even if one contributes no income from labor.*"

Strictly speaking, the inequality $r>g$ announced by Piketty is not a sufficient condition for the outstripping growth of the largest fortunes and for the rising in wealth inequality, which was noted in a number of publications (for example, Milanovic, Branko, 2015; Ray, Debraj, 2014; Bernardo at all, 2014). This inequality means the excess of the capital income rK_{fi} of i-th household relative to the value of capital accumulation gK_{fi} necessary to maintain a constant level of wealth of this household in GDP units (K_{fi}/Y). However, the outpace (relative to GDP) growth of i-th household wealth K_{fi} requires the value gK_{fi} to be less than the non-consumed part of the household's income (savings): $s_i\, rK_{fi}>gK_{fi}$, where s_i is its propensity to save. Notice, this is also implied in the Piketty's quote above. Therefore, we will call the last inequality as "a refined Piketty condition" for the rising inequality, this inequality can be written as:

$$r\, s_i > g \qquad (21)$$

Since it is usually considered $s_i < 1$, the inequality (21) is more rigid than the condition for the growth of wealth inequality initially announced by Piketty ($r>g$),[24] and therefore absorbs the latter. It is the fulfillment of inequality (21) that is a sufficient condition for outpace rising of wealth of the capitalists, and, consequently, for the increase in wealth inequality.

Note, that inequality (21) is "individual": it can be fulfilled or not for each individual household (if $r>g$), depending on its propensity to save. It turns out according to our conclusions that the dynamics of the accumulation of individual fortunes in the long term depends on the fulfillment or non-fulfillment of inequality (21). The wealth of households for which inequality (21) holds is growing faster than GDP. If inequality is not fulfilled, then the own capital of the corresponding household grows with the GDP growth rate, and is proportional to the wages received and to the propensity to save. Consequently, if the indicated inequality were not observed for all households, then in the long run the level of wealth inequality would correspond to the level of inequality of salaries and, hence, to the level of income inequality (taking into account the difference in individual propensities to save). But this does not correspond to the observed data. As Picketty (2014, Ch. 7, p.175) rightly pointed out, "*inequality of wealth is always and everywhere much greater than inequality of income from labor*". This indicates that some of the individual fortunes are growing faster than GDP, which means that in the long run they can reach enormous proportions.

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[23] Picketti regards this inequality as a historical fact. We believe that the higher rate of return r is a consequence of the desire of the capitalists to maximize their profit.

[24] That is, if inequality (21) holds, then inequality $r>g$ also necessarily holds. However, these two conditions are close: if $r>g$, then the inequality (21) also holds for very large fortunes with $s_i \to 1$.

In this section we have studied a very important issue, which was not fully covered by Picketty and other researchers: about the sources of faster growth of the largest fortunes, and about the balance of total savings and investments. Indeed, the outpace growth of wealth requires from their owners to accumulate enormous savings, which should also grow faster than GDP. At the same time, investments in the real sector of the economy do not grow faster than GDP. That is, the savings of wealthy proprietors grow faster than total capital investments. Then, how the identity of aggregate savings and investments can be ensured?

The growing savings of wealthy owners in archaic economies could be provided by three sources in the real sector: additional income from the outside world (colonial expansion, for example); the growing debt of the state; the growing debt of not the richest households. All these three sources cannot grow indefinitely in units of GDP. Therefore, periodic upheavals are inevitable for archaic economies, zeroing out the accumulated and already overwhelming debt burden, starting with the reform of Solon in ancient Athens, and even earlier, see Hudson (2018).

It is possible to circumvent existing restrictions in a modern economy with developed financial markets. Accumulation of unsecured income is possible in such markets, which forms the unsecured component of nominal wealth. As a result, nominal aggregate savings may exceed investment in the real economy; this mechanism is described in the previous section 6. It seems that the wealth of proprietors can grow indefinitely, without prejudice to other members of society. But it turns out that this is not so. The nominal unsecured increase in wealth does not increase the amount of the real wealth; we call it the law of conservation of real wealth. And if the real wealth of some (rich) members of society is growing in GDP units, then for others (poor) it will inevitably decline.

Numerical simulation of the process of rising inequality in the presence of modern financial markets is presented in Appendix E. The results confirm the theoretical conclusions. If inequality (21) starts to hold for a number of (rich) households, this automatically means both an increase in unsecured wealth and an increase in wealth inequality. As a result, income inequality is rising due to the outpace growth of capital income of the most wealthy proprietors. The growth of real income of the rich proprietors is accompanied by a decrease in real income of the poorest households. The simulation results correspond to the observed dynamics (see, for example, CRS Report for Congress, 2011).

The schemes at the end of this section shows the main causal relationships taking place in the economy due to the increase in inequality, starting from the initial unlimited desire of proprietors to maximize profits and ending with a number of negative phenomena that are consequences of this desire. Such consequences are: slowdown of the economic growth due to low aggregate demand and low investment in the real sector; rising income and wealth inequality with the prospect of bankruptcy of poor households. Our study shows also, that in an economy with a modern stock market it is impossible to avoid the negative consequences of the outstripping growth of the largest fortunes and the rising of wealth inequality. On the contrary, the following negative phenomena are added: stock market volatility; inflation of financial bubbles; additional potential inflation. The result is economic instability and crises. Our logic of constructing causal relationships corresponds to the logic of a number of economists: Stiglitz (2012); Rajan 2010; Fitoussi & Saraceno (2009); Frank (2010); Flamant (2015). We also support the political and economic recommendations of these researchers to reduce inequality by strengthening the role of the state in the economy: tightening antitrust laws and rules for the functioning of financial markets; raising the minimum wage; progressive taxation of income and capital. All of these measures can prevent the formation of unsecured income and wealth in modern economies.

7.2 Formalization of the process of wealth inequality rising

In this subsection the equations are derived that describe the accumulation of individual wealth in the long run, if the economic growth in the real sector is balanced.[25] Study of the rising inequality in this section is methodologically different from our previous analysis, which operated with aggregated values. Presented here analysis requires a detailing down to individual households.

Inequality (21) can be obtained mathematically rigorously by considering the dynamics of the accumulation of wealth K_{fi} of i-th individual household:

$$K_{fi}(t+\Delta t) = K_{fi}(t) + s_i H_i(t)\Delta t = K_{fi}(t) + s_i(w_i(t) + r\,K_{fi}(t))\,\Delta t, \text{ or if } \Delta t \to 0,$$

$$dK_{fi}(t)/dt = rs_i\,K_{fi}(t) + s_i w_i(t) \qquad (22)$$

Let us make the change of variables $X = K_{fi}(t)/Y(t)$ and differentiate the value of the $X(t)$ over time. Taking into account obvious relation $dY(t)/dt = gY(t)$ and equation (22), we have:

$$dX/dt = (1/Y(t))\,dK_{fi}(t)/dt - (K_{fi}(t)/Y(t)^2)\,dY(t)/dt = [rs_i\,K_{fi}(t) + s_i w_i(t)]/Y(t) - gY(t)K_{fi}(t)/Y(t)^2 =$$
$$= s_i w_i(t)/Y(t) + [rs_i - g]X(t) \qquad (23)$$

We assume a balanced growth of the economy due to the growth of labor productivity with a constant population and employment. During the growth the shares of labor and capital in total income should remain, then labor productivity, wages and output should grow at the same rate g if the amount of labor is constant, which means $s_i w(t)/Y(t) = const$.[26] Then the solution to the last differential equation is:

$$X = K_{fi}(t)/Y(t) = s_i w_i(t)/[Y(t)(g - rs_i)] + const_{1i} \times exp\,(-t \times (g - rs_i)) \qquad (24)$$

The constants in the last equation can be calculated based on the initial conditions:

$$const_{1i} = [K_{fi}(0)(g - rs_i) - s_i\,w_i(0)]/[Y(0)(g - rs_i)]$$

Note that the first term on the right-hand side of equation (24) does not depend on the initial value of wealth. Therefore, we shall call this term as a purely labor component in the wealth accumulation.

If the condition $rs_i > g$ is fulfilled for the i-th household, which corresponds to the refined Picketty condition (inequality 21), then the second term on the right-hand side of equation (24) experiences an exponential increase in time. The own capital of the household K_{fi} will grow at a faster pace relative to GDP. It is this kind of growth that occurs due to the accelerated reproduction by the capital of oneself that is described in the above quote by Picketty. In this case, the first (purely labor) term of equation (24) can be neglected in the long run. Therefore, we say that the second (exponentially growing) term is responsible for the capital component of the accumulation of the i-th individual wealth K_{fi}.

If, on the contrary, the inequality $rs_i < g$ is satisfied, then the exponential term on the right-hand side of equation (24) tends to zero, and the ratio $X(t) = K_{fi}(t)/Y(t)$ asymptotically tends to a constant level, when $t >> 1/(g - rs_i)$:

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[25] The balanced economic growth means growth with constant shares of total labor and capital income ($rK_n(t)/Y(t)$ and $w(t)L/Y(t)$), if r is a constant this means the constancy of $K_n(t)/Y(t)$.

[26] A case of a steady population growth at a rate n is considered apart in Appendix D; in such case balanced growth implies a decrease in the ratios $w_i(t)/Y(t)$and $s_i w_i(t)/Y(t)$. Then the largest fortunes will grow at a faster pace under the lower (in comparison with inequality 21) rs_i value: $rs_i > g - n$.

$$K_{fi}(t)/Y(t) = s_i w_i(t)/[Y(t)\ (g - rs_i)]\ )] = const_{2i} \quad (25)$$

The constants are also determined from the initial conditions:

$$const_{2i} = s_i w_i(0)/[Y(0)\ (g - rs_i)]$$

According to equation (25), the equilibrium value of wealth accumulated by the *i*-th household is directly proportional to the propensity to save and to the wages, and does not depend on the initial value of wealth. The stability of the K_{fi}/Y ratio means the possibility of a long-term scenario of economic growth with a constant (not growing) level of wealth inequality. Individual households' propensities to save s_i in this case may differ from each other within wide limits. However if all of them are constant in the long run and satisfy the inequality $s_i < g/r$, then all corresponding individual fortunes K_{fi} will grow at the same rate g, which coincides with the growth rate of total output. Then a ratio of any two individual households' fortunes K_{fi}/K_{fj} will be a constant also, that is, the wealth inequality does not increase. In this case the wealth inequality in the long run should be proportional to inequality in labor incomes, taking into account individual propensities to save, regardless of the original wealth inequality.

This does not correspond to the actual data, because wealth inequality is always much greater in comparison with inequality of labor income. The obvious reason for this difference is the outpace accumulation of the largest fortunes, for which inequality holds (21). Indeed, the scenario of the balanced growth of the economy described above, in which the increase in wealth inequality does not occur (if the values of individual labor savings in units of GDP $s_i w_i/Y$ are stable), is impossible if one or several (rich) households save too much, so that $s_i > g/r$. There will be an unlimited exponential growth of the wealth of such households relative to GDP, K_{fi}/Y, due to the second term in the right side of Equation (24). In this case the gap between the largest fortunes and the individual own capitals accumulated through labor income savings will grow, the faster the greater the difference $s_i r - g$. This difference can be especially large if a growth rate of the economy is low.

On the contrary, if the rate of economic growth will become high, then the difference $s_i r - g$ will decrease. It means that the value of the second exponential term on the right-hand side of equation (24) will decrease with respect to the first term, which is responsible for labor income accumulation. Labor income accumulations will have a larger share. Inequality in labor income and accumulation is less than the inequality due to the outpace growing of the largest fortunes. Then the wealth inequality should decrease in the case of a sharp acceleration of economic growth (and vice versa). This is exactly what the actual data demonstrate, see for example, Picketty (2014, Ch. 10, Fig. 10.1-10.6), the period from 1910 to 1970. Later inequality begins to rise again amid a slowdown in the economy.

Thus, the nature of wealth inequality and of its growth is determined by the presence or absence of very large fortunes, for owners of which inequality (21) holds, $s_i r > g$. Further we will consider an economy where such large fortunes exist, which are growing faster than GDP. The growth dynamics of these fortunes is determined by the difference $s_i r - g$, which in turn critically depends on the economic growth rate g. At the same time, the wealth of other, less affluent households (workers) will grow at the same rate as the GDP, if their propensities to save remain unchanged.

7.2.1 Rising in wealth inequality. Aggregated values

We use the equations (24) and (25) obtained in the previous paragraph, which describe the accumulation of individual capital in the long term, to calculate the aggregate values of savings and accumulated wealth separately for rich and poor households. This approach reveals an important negative consequence of the outstripping growth of the largest fortunes and of the inequality rising. The consequence is the inevitable impoverishment of poor households with the prospect of their bankruptcy. Let us divide all households into two groups, with the different

dynamics of wealth accumulation; we will call them capitalists and workers. The division is made so that for all capitalist households inequality (21) is fulfilled, while for all households-workers it is not. Then the aggregate wealth of K_f can be divided into two components: the total wealth of workers K_f^w and the total wealth of capitalists K_f^c; more convenient in units of GDP:

$$K_f(t)/Y(t) = K_f^w(t)/Y(t) + K_f^c(t)/Y(t) \quad (26)$$

The total wealth of workers ($i \epsilon W$) in units of GDP will be equal, in accordance with equation (25), if $t >> 1/(g - rs_i)$:

$$K_f^w(t)/Y(t) = \sum_{i \epsilon w} K_{fi}(t)/Y(t) = \sum_{i \epsilon w} s_i w_i(t)/[Y(t)(g - rs_i)] \quad (27)$$

The total wealth of capitalists ($i \epsilon C$) in units of GDP can be expressed in accordance with equation (24) as:

$$K_f^c(t)/Y(t) = \sum_{i \epsilon c} K_{fi}(t)/Y(t) = \sum_{i \epsilon c} \{s_i w_i(t)/[Y(t)(rs_i - g)] + (const_{2i} \times exp(t \times (rs_i - g))\} =$$

$$= \sum_{i \epsilon c} \{s_i w_i(t)/[Y(t)(rs_i - g)]\} + \sum_{i \epsilon c} const_{2i} \times exp(t \times (rs_i - g)) \quad (28)$$

In the long run ($t >> 1/(rs_i - g)$), the first sum which is responsible for the "labor" part of capitalists' accumulation is constant, while $s_i w_i / Y = const$. Simultaneously, the terms of the second sum grow exponentially, which means that the whole sum grows unlimitedly. Consequently, the total wealth of capitalists in units of GDP K_f^c / Y is also growing without limits.

Note that the actually observed data give every reason to consider the long-term real-sector growth of most actually functioning economies to be balanced, so that their total nonfinancial capital is growing at the same rate as GDP, $K_n/Y \approx const$. Indeed, the stability of this ratio has been included in the list of "Kaldor facts" (Kaldor, 1957); it is also confirmed by minor changes in the ratio of nonfinancial capital to GDP in the US economy (see the curve with a marker ○ in Figure 5 below); similar observations for a number of countries were cited by Weil (2013). The increase in the capital-to-output ratio noted by some researchers (e.g., Piketty & Zucman, 2014) refers, as a rule, not to the nonfinancial capital K_n, but to the total wealth K_f, which includes a growing unsecured component.

But if K_n grows at a rate of g, and K_f^c - faster than g, then sooner or later the second value will be equal the first, and then will be ahead of it,

$$K_f^c(t) > K_n(t), \text{ (if } s_i r > g \text{ for } i \epsilon C \text{ in over } t >> 1/(rs_i - g)) \quad (29)$$

In this case, the savings of the capitalists will exceed the total investment in the real sector. Indeed, if inequality (21) holds for all capitalist households (if $s_i r > g$ for $i \epsilon C$), then inequality (29) can be rewritten:

$$\sum_{i \epsilon c} rs_i K_{fi}(t) > gK_n(t) = I_{net}(t), \text{ (if } s_i r > g \text{ for } i \epsilon C \text{ in over } t >> 1/(rs_i - g)) \quad (30)$$

Therefore, for the savings of wealthy proprietors S_c the relation holds:

$$S_c(t) = \sum_{i \epsilon c} [s_i (w_i + rK_{fi}(t))] > \sum_{i \epsilon c} rs_i K_{fi}(t) > gK_n(t) = I_{net}(t), \text{ or}$$

$$S_c(t) > I_{net}(t), \text{ (if } s_i r > g \text{ for } i \epsilon C \text{ in over } t >> 1/(rs_i - g)) \quad (31)$$

Of course, such a significant increase in the capitalists' total wealth and savings may seem an allegory divorced from real life. Yet such allegory allows us to show clearly the problem associated with the rapid growth of the largest fortunes. Let us back to equation (26). If the

wealth of capitalists in GDP units K_f^c/Y is growing, then either the K_f^w/Y ratio should decrease (which is necessary for K_f/Y to be constant), or we must recognize the possibility of increasing the K_f/Y ratio while the growth of the real sector of the economy is balanced ($K_n/Y=const$). The first option corresponds to an archaic economy, for which aggregate wealth is equal to total value of nonfinancial assets, and is relatively stable in units of GDP. The second option, providing for the possibility of K_f/Y growth, means the possibility of a difference between the total wealth of K_f and the total nonfinancial capital value K_n. This is only possible with modern stock markets that allow free market pricing of securities.
Since the possible consequences of the outstripping growth of the capitalists' wealth are different, depending on the presence or absence of a modern stock market, then these two cases are considered separately in the following subsections.

7.3 Rising in wealth inequality in an archaic economy

It is shown in this paragraph that in an archaic economy, in the absence of a modern stock market, the source of outpace growth of the largest fortunes is not only the not consumed part of the added value created in the real sector, but also the direct flow of wealth from other entities, in particular, from the less affluent households. The inevitable consequence of such a mechanism in the long run is the increase in wealth inequality and the bankruptcy of not the richest households.
First, we will show that in an archaic economy the outpace growth of capitalists' wealth cannot take place simultaneously with the constancy of the wealth of workers in GDP units, that follows from equation (27).
In an archaic economy the value of financial assets is equal to the value of the obligations that secure these assets in the issuer's balance sheet. Thus, there is no reason for the appearance of unsecured wealth, and the aggregate wealth in the two-sector economy under consideration is equal to the total value of non-financial assets:

$$K_f(t)=K_n(t) \text{ (in an archaic economy)} \qquad (32)$$

And then inequality (29) can be rewritten:

$$K_f^c(t) > K_f(t), \text{ (in an archaic economy, if } s_i r > g \text{ for } i \epsilon C \text{ in over } t >> 1/(rs_i - g)) \qquad (33)$$

And, comparing the last inequality with equation (26), we obtain

$$K_f^w < 0, \text{ (in an archaic economy, if } s_i r > g \text{ for } i \epsilon C \text{ in over } t >> 1/(rs_i - g)) \qquad (34)$$

That is, the outpace growth of the largest fortunes in an archaic economy leads to the fact that the total workers' wealth K_f^w becomes negative, and at least a part of these households will have negative equity, being potential bankrupt. This conclusion contradicts equation (27) declaring the constancy of K_f^w/Y, which was deduced under the condition of constant values of $s_i w_i/Y$. So, in this case the savings of workers (in units of GDP) cannot be constant; they must decline in order to compensate for the growth of capitalists' savings. In an archaic economy the outpace growth of capitalists' wealth the farther the more is fueled by reducing the share of savings of the remaining subjects. Indeed, if K_f^c/Y grows in accordance with equation (28), while $K_f/Y=K_n/Y$ is constant, then the value of workers' wealth in units of GDP, K_f^w/Y, should decrease according to equation (26).

We get a paradoxical conclusion: having market power, wealthy capitalists can force (with market methods) poor workers to consume an increasing share of their income, reducing their propensity to save, down to negative values.[27] That is, the propensity to save of the poor households is no longer completely their "personal affair", it can be influenced from the outside. Therefore it becomes clear that the outpace growth of capitalists' wealth in an archaic economy requires growing casualties from workers (or from the state and the outside world if they are included in consideration).

The inevitability of the redistribution of wealth in an archaic economy, while an outstripping growth of the largest states, also follows from the fact that in this case the total savings of workers will become negative in the long run. Indeed, in an archaic economy total savings and investments in the real sector are equal. For a closed economy, excluding the public sector it means,

$$S_f(t) = S_c(t) + S_w(t) = S_n = I_{net}(t), \text{ (in an archaic economy)} \qquad (35)$$

Then the fulfillment of inequality (31) means that the aggregate savings of households-workers become negative,

$$S_w(t) < 0, \text{ (in an archaic economy, if } s_i r > g \text{ for } i \epsilon C \text{ in over } t >> 1/(rs_i - g)) \qquad (36)$$

The aggregate wealth in an archaic economy grows solely due to the not consumed part of the added value, that is, due to the savings equal to the investments in the real sector. Aggregated values of wealth and savings in such an economy are growing at a rate of GDP growth. But if the largest fortunes grow faster, this means that capitalists take a larger and larger share from a fixed (in units of GDP) volume of aggregate savings. Accordingly, the employees are left with a smaller share. At a certain point in time, the savings of the rich will absorb and then exceed all the cumulative savings of the real sector, and the savings of workers will become negative.

Negative savings of workers mean a decrease in their net worth. Moreover, the outpace growth of the largest fortunes in an archaic economy inevitably leads to an increase in the debt burden of poor households. Indeed, according to inequality (31), wealthy capitalists save more than they invest in the real sector. Therefore the net lending of these households is positive, that is, they will lend to other subjects. In a closed archaic economy, aggregated net lending is zero. Consequently, net lending to poor households is negative, if the state excluded. That is, a constant increase in employee debt is inevitable, with the prospect of their bankruptcy.

In this subsection we focus only on one important consequence of the rising in wealth inequality - on the impoverishment and bankruptcy of poor households. Yet this is not the only negative consequence of the increase in inequality, the others will be discussed below in paragraph 7.5.

In a really functioning economy, the positive net lending of wealthy capitalists can be additionally compensated by a negative net lending of other economic entities: the state (budget deficit) and the outside world (colonial expansion and net export). All this, apparently, took place historically in archaic economies: a growing public debt, colonial expansion in the outside world, and a decline of the poor households' share in total wealth. The trends described are not healthy and cannot last very long. The growth of public debt is fraught with inflation and/or devaluation of the national currency, so the values of public debt and budget deficit are usually limited. The growth of wealth at the expense of the outside world (due to net exports) also has limitations, since it is associated with problems in the economies of importers or colonies; the latter will sooner or later try to balance and streamline their foreign trade turnover.

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[27] There are various methods used by capitalists, having market power, to redistribute aggregate income and wealth to their advantage. For example, they can set monopolistically high prices, implying high profits, for goods and services, especially for vital necessities - medicines, medical insurance and public services.

The described here scenario shows that an archaic economy cannot function long and well-off if the largest fortunes (for which inequality 21 holds) grow at a faster pace than GDP. In our opinion, this is the cause of periodic turbulence, which results in the cancellation of accumulated private and state debts and the redistribution of property in the direction of reducing inequality (from the destruction of Solon's debt pillars to bankruptcies of states, uprisings and wars).

7.4 Rising in wealth inequality in a modern economy

It would seem that the presence of modern stock markets can correct the mentioned above catastrophic consequences of the unlimited desire of capitalists to maximize their profit in the archaic economy. The know-how of such markets is the formation of the unsecured value of financial assets and of the unsecured wealth. In this case, savings are no longer necessarily equal to investments (Eq. 35 is not necessarily observed), and aggregated net lending may be greater than zero. Therefore, the surplus savings of capitalist households regarding their investment in the real sector (according to inequality 31), the result of which is positive net lending of these households, can be absorbed by the increase of the unsecured value of financial assets (the increase of unsecured wealth), without a decrease in net lending of other economic subjects. Moreover, such absorption occurs automatically: the not reinvested savings are equal to the unsecured financial profit ($r_f K_f - r_n K_n = S_f - I_{net} > 0$, see Equations 15 and 16 in Section 6), which in turn corresponds to the unsecured increase in the value of financial assets.

Thus, the outpace growth of the largest fortunes in the modern economy can be funded by the growing unsecured income. Such income avoids the harsh scenario discussed above for the archaic economy, when the outpace growth of the largest fortunes is funded by direct redistribution of the workers' wealth in their favor. It seems that the excess wealth of the capitalists, outreaching the total nonfinancial assets (see inequality 29), no longer means the obligatory impoverishment of workers. That the largest fortunes can grow at a faster pace due to the generation of ever new volumes of unsecured value of financial assets and unsecured wealth by the financial market, without the flow of wealth from other subjects. It seems that the wolves are fed (capitalists can get their huge profits and ramp up wealth ahead of the pace), and the sheep are safe (the painful redistribution of wealth and impoverishment of the poorest households can be avoided). Unfortunately, it is not true. According to the conservation law formulated here, the aggregated real wealth corresponds to the total value of nonfinancial assets, and goes up with the growth rate of output in the real sector of the economy. Therefore, the outpace growth of the largest fortunes will impede the balanced growth of real labor income accumulations, their share in the total wealth will decrease. The decrease in incomes and savings of poor households cannot be avoided, up to their impoverishment. This intuitive conclusion is confirmed both by the results of numerical simulation of the rising inequality dynamics (see subsection 7.4.1 below), and by actually observed data, see subsection 7.4.2.

7.4.1 Numerical simulations of the rising inequality dynamics in the modern economy

A detailed description of the model of the dynamics of wealth accumulation in the modern economy with advanced financial markets is given in Appendix E. The calculations are performed using Excel in the attached file “Numerical simulation of the rising inequality dynamics”. The dynamics of income, consumption, and wealth is calculated recursively for 100 individual households over 20 time periods. For such an analysis an approach was used that significantly differs from that used in the previous sections. We must abandon the consolidation of a number of values when considering the issues of inequality and of the redistribution of income and wealth. Consolidation aligns the picture. Someone is super-rich, and someone is bankrupt, while consolidated statistics at the same time shows an average well-being. Therefore, the dynamics of income, consumption and net worth for each of the 100 individual households (90 “poor’ and 10 “rich”) are tracked in the model presented in Appendix E, instead of the consolidated values. We assume that in the period preceding the analysis the growth of the economy was balanced and inequality did not increase. Wealthy households have accumulated

only 40% of total wealth. Then, at the moment t=0, an unsecured jump in the fortunes of wealthy households happened (for example, the financial assets belonging to them have instantly rose in price); at this moment inequality in the distribution of wealth among households have increased to a level, when 60% of wealth belongs to the rich and only 40% to the poor. Income of the poor households consists mainly of wages, while the rich ones receive capital incomes mainly.

The own capital of each household can be estimated separately only by analysis of the financial side of capital (wealth). In order to track the dynamics of the accumulation of wealth of an individual household, it is necessary to calculate his savings by using Haig–Simons income, which includes financial income and revaluation of financial assets owned by the household. When applying this method, part of financial income and part of the increase in wealth may be unsecured, in which case the law of conservation of wealth is violated in nominal terms. Just such a case is considered here.

Noncompliance with the law of wealth conservation in the nominal terms entails a paradox: total household incomes are not equal to total expenditures, and total savings are not equal to capital investments in the real economy, see Equations (15) and (16) in Section 6. The explanation of the paradox is given in Section 6: income is calculated as the Haig–Simons income (including the unsecured component), while the expenditures (consumption and investment) are calculated according to the traditional method, in conformity with the data of the real sector of economy. The values of income and expenditures are not equal to each other if the law of conservation of wealth is not hold in nominal terms.

We have considered three specific scenarios of economic growth in the present model, all of which accompanied by an increase in unsecured wealth. The main simulation results for these scenarios are shown below in Table 3. The first scenario is the luckiest. The wealth of all households is growing, but the fortunes of wealthy households grow faster, due to the unsecured income. Unsecured component of wealth is growing, resulting in faster growth of the national wealth relative to the value of nonfinancial capital. Such growth means inflating a financial bubble and it cannot continue infinitely. A correction or a collapse in the stock market is bound to happen someday, as a result of which the amount of aggregate wealth will return to conformity with the total value of nonfinancial capital. It turns out in this case, that the “real” (after correction) wealth of the poor households has grown less than the economy as a whole. That is, the poor have become poorer in real terms relative to the average level, and has decreased their share both in total wealth (from 40% to 28,7%) and in total income (from 76,4% to 69,4%). Note that the process of rising inequality due to unsecured income and wealth is irreversible for all three scenarios considered. Even if unsecured wealth will subsequently decline, or even disappear (for example, as a result of a stock market crash), the inequality level will not change.

We consider the first scenario not quite plausible. During this scenario the additional unsecured income is fully absorbed by the increase in the value of financial assets and does not have any effect on the processes occurring in the real sector (first of all on aggregate consumer demand). However, the unsecured income, most of which is received by wealthy households, should inspire optimism in the latter, increasing their consumer demand. To take this into account, the model is complicated for the 2nd and 3rd scenarios. We have assumed that the rich households, receiving additional unsecured income in the current period, will decide to spend part of it for additional consumption, above the previously expected value. This must lead to an increase in consumer demand and, as a result, to an increase in prices. Thus, “splashing out” of a part of unsecured income on the consumer market as an additional demand causes inflation of demand. For the first scenario inflation does not arise, despite the fact that the unsecured income exists. The reason is that this (unsecured) income is completely absorbed by the unsecured increment in value of financial assets for this scenario.

The second and third scenarios differ in the response of poor households to rising prices. In the second, frugal scenario, they remain unchanged propensity to save, and do not change the

nominal consumption, while reducing the real one. In this case their share in total wealth is also declining, but not as fast as for the 1st scenario.
The third scenario is in our opinion the most realistic and dramatic at the same time. For this scenario, poor households are trying to maintain the status quo, and do not reduce the planned real consumption in the current period, despite the rising prices. Such state of affairs really seems plausible, when the poor households do not abandon their planned purchases in the current period, even if prices have increased. In this case, they can "overlook" the excess of their expenses over incomes by taking advantage of a consumer loan, hoping for wage growth in the future. The consequences are dire for poor households.

Table 3 Results of the numerical simulation of the rising inequality dynamics in Appendix E

Variable/Scenario	Initial value	1st scenario	2nd scenario	3rd scenario
Rich household's share in total wealth K_f^c/K_f	0.6	0.713	0.684	0.738
Rich household's share in total income H_C/H	0.236	0.306	0.285	0.301
Rich household's share in total consumption C_C/C	0.15	0.15	0.180	0.170

For the third scenario, similar to the second, inequality in income and wealth has increased. Moreover, the poorest households become potential bankrupts, as their own capital becomes negative. In addition to the indirect redistribution of wealth, which takes place for the 1st scenario, the 3rd scenario suggests also a direct redistribution. The poorest households, striving to maintain their standard of living, spend more than they earn, and their net lending is negative. If someone has a negative net lending, then this should be offset by positive net lending of some other entity (by a wealthy household in this case). That is, the rich households for the 3rd scenario are rapidly becoming richer not only due to excess unsecured income, but also due to a decrease in the wealth of poor ones. The rich get richer not "by itself", but also due to the fact that the poor become poorer. Below we demonstrate that the statistics actually observed in recent decades are in qualitative agreement with the simulation results for the last scenario, in which impoverishment of poor households occur due to their negative net lending.

7.4.2. Statistics confirm the simulation results

US statistics show the following:
(a) The lion's share of the increase in US total real income (from 1996 to 2006) was received by the richest households. At the same time, the real income of the poorest 20% of households (Q1) even decreases, see the figure 3 below.
(b) A decrease in total household savings occurs in recent decades, up to the 2008 crisis (Frank et all, 2010, Fig. 1); see figure 4 below. The national accounts data have been used that do not take into account unsecured income.

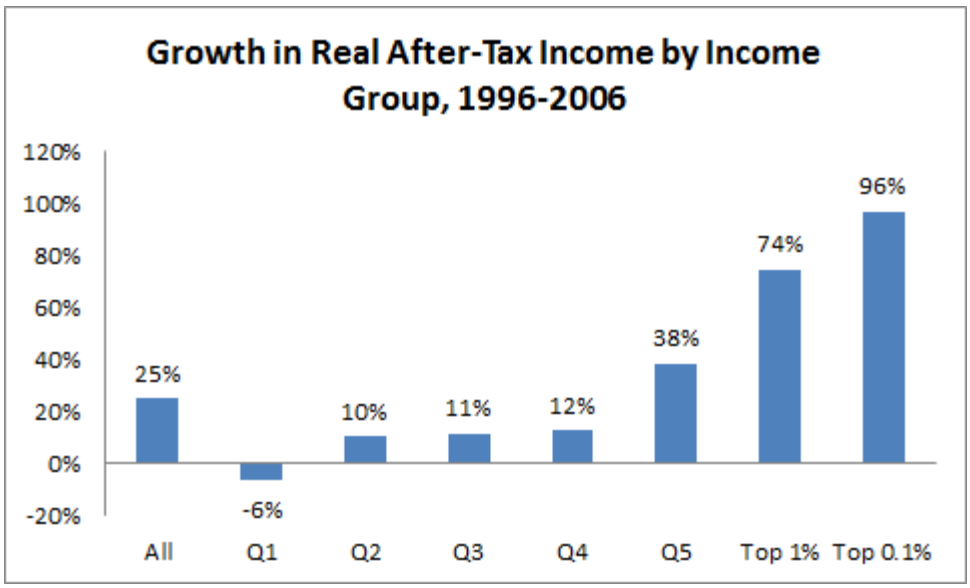


Fig 3. USA. Source: Bernstein J., 2012 based on CRS Report for Congress, 2011.

(c) Adjusted (poor) households' net lending has been decreased over the past decades, until the 2008 crisis, down to its negative values (solid line in Fig. 4 below). Dividends are excluded from net lending; they are received mainly by wealthy households, see, for example, Table 1 in CRS Report for Congress, 2011. Therefore this indicator to some extent characterizes net lending of not the richest households.

(d) The observed (temporary) increase in savings and net lending of poor households in several post-crisis years is not a change in trend; this increase was due to the enormous infusion of state financial resources into the economy due to an unprecedented budget deficit, which reached 12.8% of GDP in 2009, see dotted line in Figure 4.

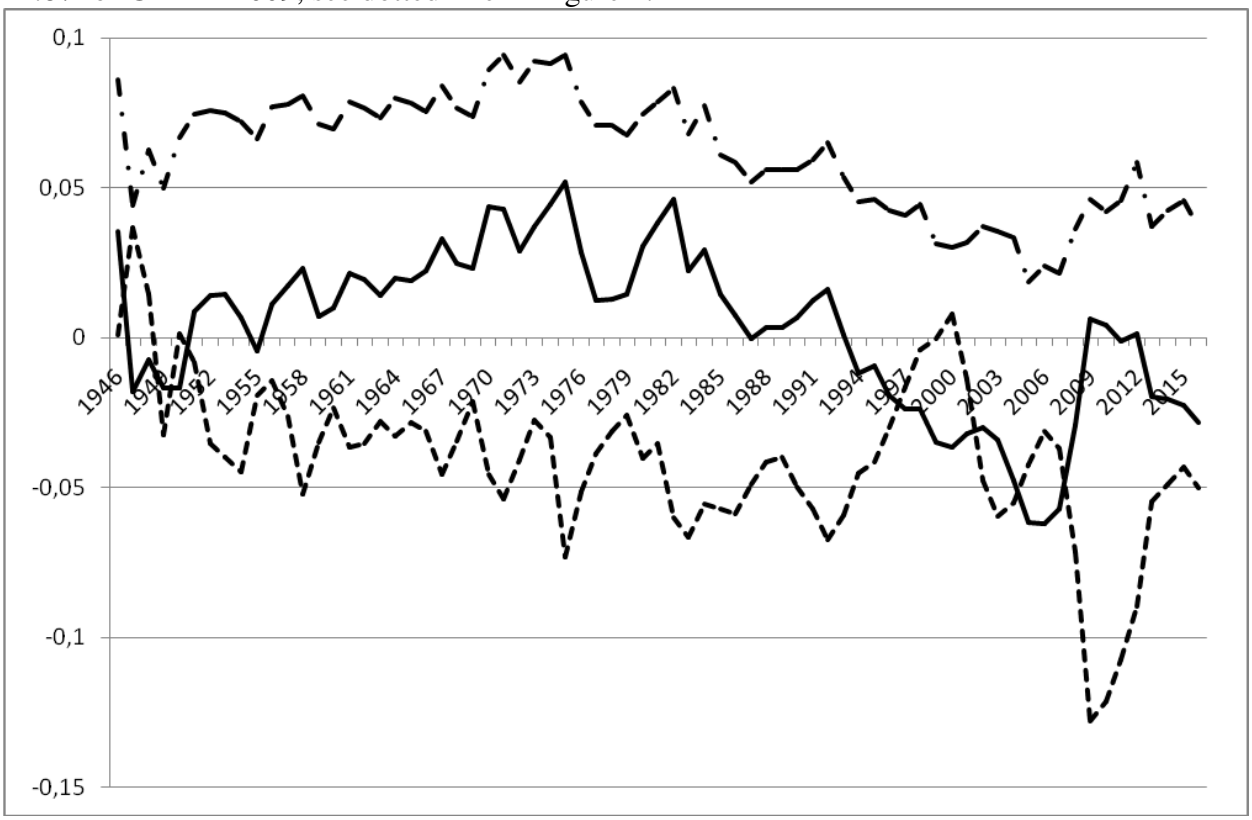


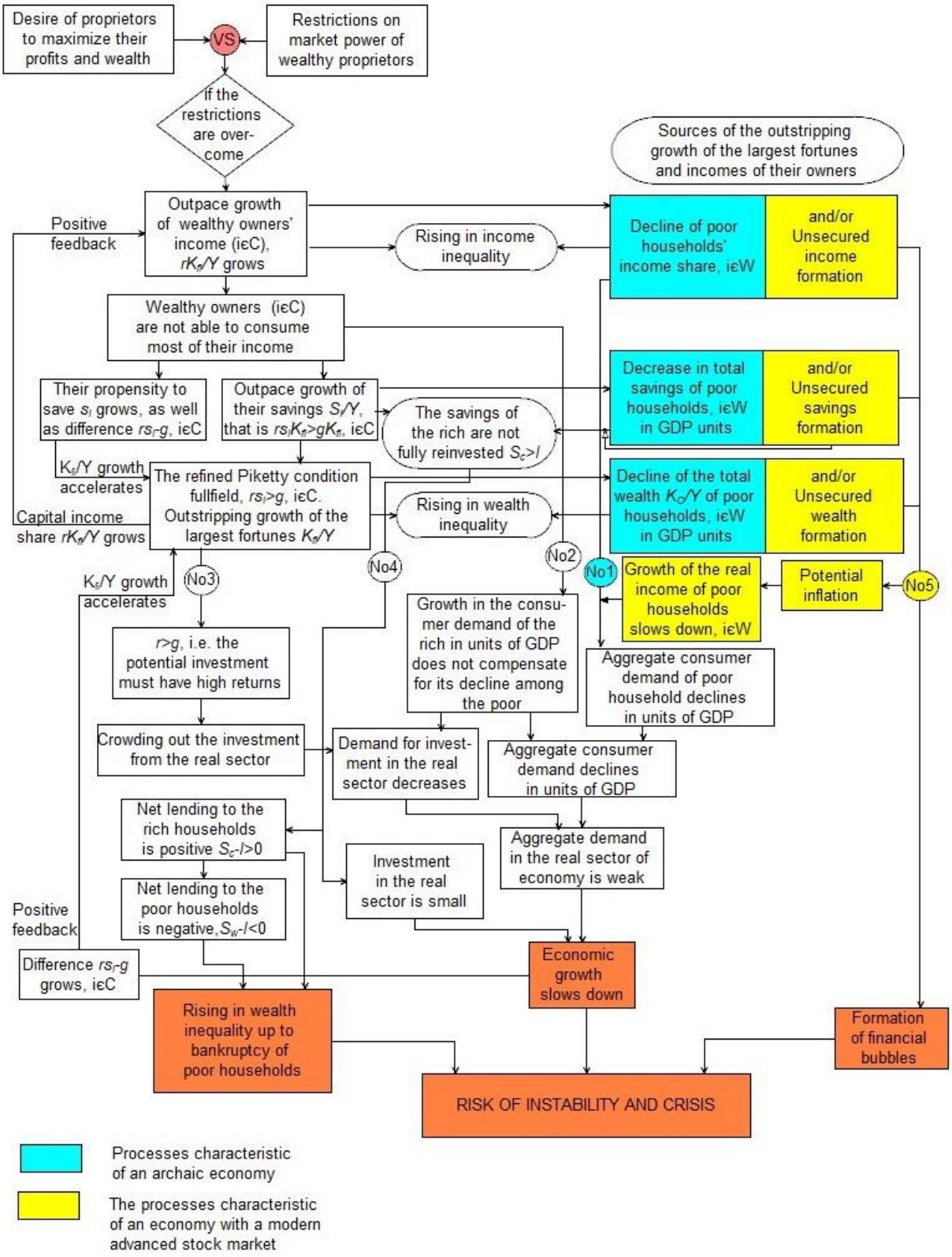
Fig 4 USA. Aggregate household savings (dash-dot line); households' net lending, net of dividends paid (solid line); state budget deficit (dotted line). Data Sources are in Appendix G.

The figure shows an unhealthy trend is observed in recent decades. The net lending of the poor households has dropped sharply, down to negative values, which means an imminent prospect of bankruptcy of a significant part of them in the future. Moreover, low savings and negative net lending of households-workers mean that their wealth is redistributed in favor of the capitalists. The redistribution of total income in favor of wealthy households (Fig. 3) contributes to the wealth redistribution since these processes are interconnected by a positive feedback.
The negative net lending of poor workers, observed since the mid-1990s, is probably due to the desire of low-income households to maintain their status quo. This mechanism is described in Appendix E in the 3rd scenario. The model demonstrates that real wealth of all such households is declining. For the most well-off and thrifty of them, this process is slower than for the wasteful ones. However in any case, bankruptcy is inevitable for some (the poorest) households.
This trend towards potential bankruptcy of poor households may be one of the causes of the global financial crisis of 2007-2008. The Figure 4 shows that the trend towards impoverishment of the poor resumed in 2012 after a brief respite. This threatens a new increase in inequality, the insolvency of households-workers and their bankruptcies in the near future.

7.5. The causes and the consequences of rising inequality

Consideration of the rising inequality will be incomplete without an analysis of the causes of this phenomenon and its consequences. Such an analysis should cover the relationship between the many processes occurring in the economy, including the relationship between the rising inequality and economic growth, its sustainability and crises. We visualize these relationships in Scheme 1 below, the upper part of which shows the reasons for the rising inequality, and the lower - its consequences.
The upper left part of the scheme shows original root reason and its realizing. Such cause from our point of view is the desire of proprietors to maximize their profits and wealth, called by Weber (1905) as “spirit of capitalism” and by Keynes (1936) as "animal spirits". It is widely believed now that in their quest for maximum profits wealthy owners, being the employers, benefit the entire economy and society. Stiglitz (2012) challenges this thesis.

SCHEME 1. THE REASONS FOR THE RISING INEQUALITY AND ITS CONSEQUENCES



We also believe that the interests of capitalists do not always coincide with the interests of the rest (the most) of society. Therefore state and public institutions are called upon to limit the animal spirits of the owners of the largest fortunes with a reasonable framework. The advisability and extent of specific restrictions is a debatable issue. However, the actions of governments in modern developed economies, as a rule, have the liberal focus, expanding the capabilities of

capitalists.[28] Therefore, seeing the existing realities, we assume the absence of serious restrictions for wealthy owners in the present analysis.

The two formally different aspirations of the capitalists (to maximize profit and wealth) are interconnected. In order to increase wealth K_{fi} in the long run, you need to maximize the flow of income and savings. In turn, to maximize income, primarily its capital component rK_{fi}, a wealthy owner needs a large amount of wealth. Income, including profit, is formally "primary" in the sense that in their absence the wealth will not appear. However, when considering the increase in income inequality, the key factor is the increase in wealth inequality, as we justified above. Really, if income inequality is determined primarily by the difference in salaries, then the wealth inequality should not differ much from the income inequality, which does not correspond to the observed data.

The fortunes of not the richest households ($i \epsilon W$) in a growing economy go up at a rate equal to the growth rate of their salaries, which corresponds to the growth rate of labor productivity and aggregate output, see Equation (25). At the same time wealthy owners (iϵC), having market power, strive to increase their income and wealth at a faster pace relative to GDP.[29] A sufficient condition for the outpace growth of large fortunes is the fulfillment of inequality (21) for their owners: $rs_i > g$, for $i \epsilon C$, see equation (24).

It is of our interest how one can achieve the fulfillment of inequality (21)? What are the direct causes for the rapid growth of the fortunes? The formal reasons for fulfillment of this inequality are a high return on capital ($r > g$), combined with a high propensity to save of wealthy households, $s_i > g/r$. Such an interpretation may be relevant for an archaic economy, at the stage of primary accumulation of capital (for example, the growth of money-lender wealth described by Pushkin in in his "Miserly Knight"). However, when the formation of large fortunes has been already occurred, the stinginess of the owners is no longer necessary. Their capital income becomes so great that it is difficult to consume a significant part of it. Therefore, the saved share s will also be great (Fisher, 1919, called it the "dead hand of the past generations"). That is, not a great propensity to save is the reason for the outpace growth of large fortunes, but vice versa: the large fortunes generate huge capital income, a significant part of which is saved. The high share of savings of wealthy households is not the cause, but the consequence of their large fortunes.

The outstripping exponential growth of the largest fortunes is also due to the positive feedback between the growth of wealth and rising income. The outpace wealth growth means an increase in the K_{fi}/Y ratio, that entails an additional increase in capital income rK_{fi}/Y, which in turn provides a further outpace growth in wealth (since $s_i r K_{fi} > g K_{fi}$). The growth is accelerated additionally by the fact that the income of the owners of the largest fortunes grows faster than their consumer demand. As a result, the share of income s_i saved by such households is growing. This reinforces the positive feedback between the income and wealth of such owners, as noted by Milanovic, Branko (2013). The gap between the growth rates of the corresponding fortunes and the GDP growth rate increases, since the difference $s_i r - g$ goes up, which is an indicator of the exponent of wealth in units of GDP, K_{fi}/Y, see equation (24).

Obviously, the outpace growth of the largest fortunes and the income of their owners is the reason for the rising in wealth inequality and in income inequality. The upper left part of the Scheme 1 demonstrates that the initial reason for the accelerated growth of the largest fortunes is the unlimited desire of the capitalists for enrichment. The upper right side of this scheme shows the sources of such rapid growth. Positions characteristic of either archaic or modern economy are painted by different colors.

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[28] For example, a CRS Report for Congress, 2011 indicates a reduction in the tax burden, more so for the richest.

[29] The accumulation of capital for capitalists is a kind of competition. Similar to a runner for which it is important to run a distance faster than rivals, it is important for a capitalist to have more wealth than competitors. Maximizing profits and wealth becomes the "duty" of the entrepreneur. Weber (1905) calls the thirst for profit erected to the cult as "spirit of capitalism".

In an archaic closed economy (colored in turquoise on the diagram), where total income is equal to the total value added created in the real sector, the outpace growth of the income share of wealthy capitalists $\sum_{i \in C} rK_{fi} / Y$ should be accompanied by a corresponding decrease in the income share of the rest (not the most wealthy) households $\sum_{i \in W} (w_i + rK_{fi}) / Y$. Consequently, if propensity to save is a constant, the savings of not the richest households $S_w/Y \equiv \sum_{i \in W} s_i (w_i + rK_{fi}) / Y$ and their accumulated wealth $K_f^w / Y \equiv \sum_{i \in W} K_{fi} / Y$ will decrease in units of GDP.

That is, the "source" of the outpace growth of incomes, savings and accumulations of wealthy households in an archaic economy is the decrease in the corresponding values for households - workers. The outstripping growth of the largest fortunes means that they comprise an increasing share of total real wealth which in turn is equal to the total nonfinancial capital for the economy in question. Therefore the outpace growth of the largest fortunes can only occur due to the redistribution in their favor of the real wealth of other entities (not the richest households, the state, the outside world) for an open archaic economy.

In a modern economy with advanced financial markets (colored yellow in the diagram) the unsecured income and wealth also can be the source of the accelerated growth of the largest fortunes and corresponding incomes and savings. Indeed, in such an economy Haig–Simons total income may exceed expenditures in the real sector, and total wealth can exceed total non-financial capital (due to the increase in the value of financial assets not secured by the corresponding increase in issuer's liabilities). It may seem that the flow of wealth towards capitalists from other entities can be avoided. But this is not so in regard to real wealth, which is growing at a pace of GDP. Outpace growth of the real wealth of capitalists can occur only due to inhibition of growth (and in the long run - due to decrease) of the wealth of other entities.

The negative consequences of the increase in inequality are described in the low part of the scheme. For clarity of presentation, we have identified and designated by numbers No.1-5 several important aspects from the upper part, which are the reasons for the consequences drawn below, colored in orange. We list these reasons:

-- No.1 Consumer demand of poor households-workers in units of GDP decreases in the archaic economy due to a decrease in their share in total income. The same can be said for the modern economy, since in this case the real income of the households should be adjusted by the amount of additional inflation (see item No.5).

-- No.2 Consumer demand of wealthy proprietors is growing slower than their rapidly growing incomes. Therefore the growth of consumer demand of the capitalists does not fully compensate for the decline in the demand of the workers.

-- No.3 The profitability of financial investments is large, $r>g$, therefore capital investments in the real sector should give no less return. This contributes to crowding out investment from the real sector.

-- No.4 The outpacing savings of the owners of the largest fortunes are not spent entirely for the capital investment in the real sector of the economy. The non-reinvested savings (positive net lending to wealthy owners) are offset either by negative net lending (rising debts) of poor households in an archaic economy, or/and by an increase in unsecured savings and unsecured wealth in an economy with a modern stock market.

-- No.5 Features of a modern economy with developed financial markets are reflected. The growth of unsecured wealth in such an economy entails additional (real or potential) inflation and an inflation of financial bubbles.

Following Stiglitz (2012) we declare the negative impact of rising inequality on economic growth. This very important statement contradicts the common point of view, which claims the opposite. Adherents of this point of view believe that the large savings of wealthy capitalists, which are inevitable while the outstripping growth of their incomes, should automatically translate into large capital investments (because of the accounting identity between total savings

and investment), which in turn should contribute to economic growth. However, the thesis about large investment does not correspond to the data observed since the 1980s. Inequality is rising, but the investment in the real sector is not increasing in developed countries, rather the opposite. Evidence that inequality promotes economic growth is absent (Frank, R.H, 2010).

Where are the enormous savings of wealthy owners? The answer to this question is formulated in thesis No.4. During the outpace growth of the largest fortunes the savings of the largest owners may exceed investments in the real sector $\sum_{i \in C} S_i / Y \equiv S_c > I$ (see equation 31 in subsection 7.2). In an archaic economy, the positive difference between the capitalists' savings and investments (their positive net lending) is offset by negative net lending to workers. In other words, the excess accumulation of the rich is offset by the growing debt of the poor. For the modern economy, excess savings can be absorbed by unsecured growth in the value of financial assets, which corresponds to the unsecured income. In both cases, the huge savings of wealthy owners do not necessarily embodied fully into investments in the real sector of the economy, which refutes the main argument of the proponents of the benefits of rising inequality for economic growth.

We share the arguments of a number of economists, for example, Stiglitz (2012); Fitoussi & Saraceno, (2009), justifying the harm of rising inequality to economic growth. Indeed, from theses No.1-2 there follows a low total consumer demand in an archaic economy. The decrease in total consumer demand due to lower incomes of poor households is not fully compensated by the growth in demand of the rich ones (the latter are not able to increase consumption by the rate of income growth). This conclusion remains valid for the modern economy too, since the real (taking into account additional inflation) income of households-workers is also slowed down, see thesis No.5. The inhibition of consumer demand causes a decrease in appetite for investment in the real sector of the economy. This factor is enhanced by the effect of crowding out investment from the real sector due to the high return on financial capital, $r>g$ (thesis No.3). As we noted above, the large savings of wealthy owners do not automatically mean large capital investments in the real sector (thesis No.4), therefore investments are really small. This means that technical re-equipment and growth in labor productivity will be hindered.

Slow growth in labor productivity means weak growth in aggregate supply. Together with weak aggregate demand, this means an inhibition of economic growth (a decrease in g) which is the most important negative result of rising inequality that we have received.

A decrease in g, in turn, means an increase in the difference $s_i r - g$, which is the exponent that determines the rate of inequality rising, see equation (24).[30] A feedback appears that enhances the inhibition of economic growth. The increase in inequality inhibits the growth of the economy, and the decrease in the growth rate g, in turn, contributes to the strengthening of inequality. So, if the outpace growth of the largest fortunes is going on, then the economy inevitably drives itself into a dead end. The existence of feedback that aggravates the increase in inequality makes it unlikely the natural and painless return of the economy to a balanced growth of wealth, accompanied by a weakening of inequality. It is unlikely that capitalists who are not forced from the outside will voluntarily reduce their appetites and redistribute total income in favor of workers, as a result of which the return on capital r will decrease. Therefore, if the outpace growth of the largest fortunes has been already started, then its cessation is problematic without external intervention. The period of the middle of the 20th century was apparently an exception; the governments have drastically reduced the capitalists' market power due to a rare combination of circumstances, as Picketty (2014) noted.

The logical question is: why did the feedback identified here not really slow down the growth rate of developed economies to zero amid rising inequality? Actual observations do not confirm

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[30] Empirical data also testify to this: inequality decreased in the 20th century at high economic growth rates, and its low growth rate before and after this period was accompanied by growing inequality, see, for example, Picketty (2014, Ch. 10).

a strong feedback between the level of inequality and growth rate (Zucman G., 2016). However the apparent contradiction becomes resolved if we consider the issue of economic growth separately from the perspective of the rich and of the poor households. It turns out that the economy grows only for the rich, who appropriate all the fruits of its growth, perhaps even more so. Real median income is unchanged, that is, poor households do not feel economic growth on themselves (Piketty, Saez, Zucman, 2018: '*pretax real national income per adult, has stagnated from 1980 to 2014 for the bottom 50% of the distribution at about $16,000 a year'*). That is, the economic growth really slows down to zero for most of society.

Inhibition of economic growth is not the only negative consequence of the outpace growth of major fortunes and of the inequality rising. Another important conclusion is the impoverishment of the poorest households, up to the negative value of their own capital, with the prospect of bankruptcy. Indeed, the large savings of wealthy owners, coupled with weak investments, mean positive net lending to such households. In an archaic economy, this automatically means negative net lending to poor households, that is, an increase in their debts. The modern stock market does not improve the situation; the most realistic scenario modeled in Appendix E shows the same result. Poor households in this case are also unable to avoid reducing real incomes and savings due to additional inflation.

The increase in inequality in the modern economy is accompanied by another negative phenomenon - inflation of financial bubbles. Indeed, in the conditions of the existence of the modern stock market, the rising inequality occurs simultaneously (one might even say "due") to the growth of unsecured income and wealth. And financial bubbles are inflating just due to the growth of unsecured wealth. All three cited here negative phenomena associated with rising inequality (slowdown of economic growth; the prospect of bankruptcy of poor households and inflation of financial bubbles) reduce the stability of the economy and increase the risk of financial crisis. A number of economists (Stiglitz 2012, Frank 2010 and Rajan 2010) are also considering the rising inequality as a cause of the crisis.

Let us focus on considering the rising inequality especially in a modern economy with advanced stock markets. It turns out that the formation of unsecured wealth in modern economy is directly related to the outpace growth of the largest fortunes (it is a sufficient condition for it), and therefore to the increase in inequality. Let us prove the last statement from the converse.

Theorem 1: If in the balanced constantly growing (in real sector) economy all individual fortunes have a "labor" character ($rs_i \prec g$ is fulfilled for all households), then in the long run $t>>1/(g-rs_i)$) the unsecured wealth $K_f(t) - K_n(t)$ should tend to zero.

Proof: If all individual fortunes have "labor" character and grow at the same rate g (which is equal to the GDP growth rate), according to Equation 25, the same can be said for their sum — the total wealth K_f:

$$K_f(t)/Y(t) = s_f w(t)L/[Y(t)\ (g-rs_f)] = const \qquad (37)$$

where the aggregated propensity to save s_f can be expressed as

$$s_f = S_f(t)/H(t) = (w(t)L+rK_f(t) - C(t))/(w(t)L+rK_f(t)) \qquad (38)$$

where C is total consumption and wL is total wages. Taking into account the last equation, relation (37) can be rewritten:

$$gK_f(t) = w(t)L+rK_f(t) - C(t) \qquad (39)$$

The last relation is intuitive: in order for wealth K_f to grow at the rate of g, the necessary savings (the difference between income $wL+rK_f$ and consumption C) must be equal to gK_f.

A similar formula can be derived for nonfinancial capital K_n accumulated in the real sector of the economy.

$$gK_n(t) = w(t)L + rK_n(t) - C(t) \quad (40)$$

Subtracting equation (40) from equation (39) we get:

$$g[K_f(t) - K_n(t)] = r[K_f(t) - K_n(t)] \quad (41)$$

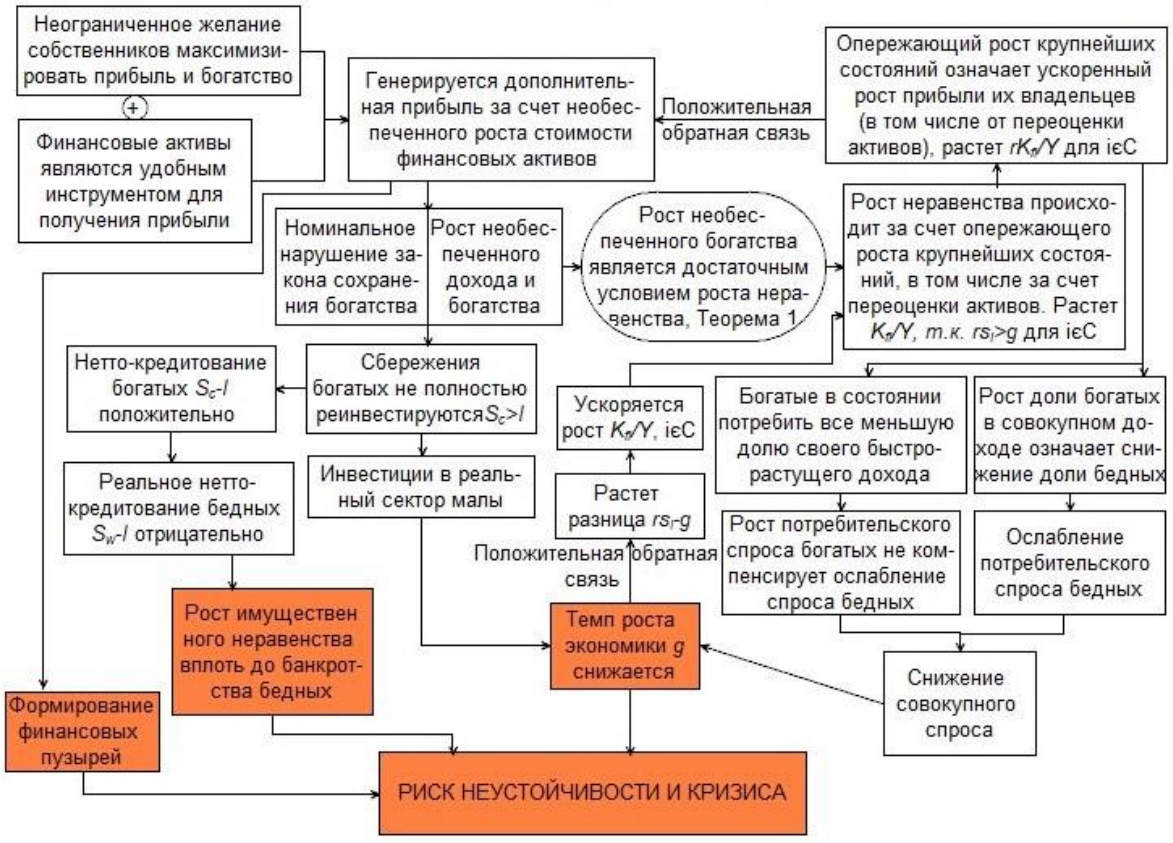
The last equation has two solutions. First is $r=g$; such a hypothetical scenario from our point of view does not have a deep meaning. The second solution has real meaning, $K_f(t) = K_n(t)$: the unsecured wealth is missing. ■

Thus, if the growth of the own capital of all households is due to labor income and savings, in accordance with equation (25), then in the long run the total wealth and the total value of nonfinancial assets will inevitably equal. This means that unsecured wealth should escape over time. However, if unsecured wealth is large and has a tendency to increase, as is actually observed, this indicates the existence of growing faster-paced fortunes, and hence the increase in wealth inequality (which we wanted to prove).

So, Theorem 1 proves that the growth of unsecured wealth is a sufficient condition for the outpace growth of the largest fortunes and for the increase in inequality. But which of them is the cause, and which is the consequence? Is growth in unsecured wealth causing inequality rising, or vice versa?

Below is Scheme 2, which shows (in a somewhat simplified form compared to Scheme 1) the relationship between the causes and consequences of rising inequality in the modern economy.

СХЕМА 2 (упрощенная). ПРИЧИНЫ И СЛЕДСТВИЯ РОСТА НЕРАВЕНСТВА В СОВРЕМЕННОЙ ЭКОНОМИКЕ



As it is indicated above, we consider the unlimited desire of the proprietors to maximize their profit and wealth as the initial root cause of the described phenomena. Financial assets, the value of which is determined in the stock markets, are an appropriate tool to achieve these goals. The value of such financial assets is volatile, and can vary significantly (as a rule, exceed) relative to the value of the obligations providing these assets in the issuers' balance sheet. The difference

between the value of financial assets and the corresponding obligation forms the unsecured wealth. Rich owners with market power can stimulate an unsecured increase in the exchange value of their securities, increasing wealth in accordance with their aspirations. Therefore, we consider the growth of unsecured wealth as a direct consequence of the animal spirits of the capitalists. The outpace growth of the largest fortunes and the rising inequality, which are an inevitable consequence of the growth of unsecured wealth, are in this case a "side effect" of the aspirations of wealthy proprietors. Thus, we believe that the desire of capitalists to maximize income and wealth through the stock markets, generating unsecured income and wealth, bears the main responsibility for the inequality rising observed today. Together with Fitoussi J. P. & Saraceno F., (2009) we believe that the 2007-2008 crisis was triggered by the activity of these markets. A very important political and economic conclusion follows from the above: the functioning of the modern stock markets is not neutral for the economy as a whole. It is impossible to effectively combat the increase in inequality without eliminating unsecured wealth and the causes of its appearance.

8. If the stars are lit, then someone must need them…[31]

It was shown above that the free circulation of securities in the stock market causes a break of the tight connection between the value of these securities and the corresponding issuer's obligations. The difference may be formed between the market value of financial assets and the counterpart obligations. The part of the value of financial assets, which corresponds to this difference, is not secured. The growth of the unsecured component of the financial assets value automatically means the growth of unsecured income and wealth, which entails additional inflation and formation of financial bubbles. Moreover, the growth of unsecured wealth necessarily means the outpace growth of the largest fortunes, that is, the rising in inequality. This, in turn, entails a slowdown in economic growth, as well as impoverishment of poor households with the prospect of their bankruptcy. All these negative phenomena are a potential cause of instability of the economy and of crises. However, why are we not witnessing attempts to counter these negative trends? Why are there no hard restrictions on the stock market? The answer is obvious: because it is profitable for someone.

It may be good or bad, but striving for income and for profit maximizing has become one of the main goals of a human being. The richest households-capitalists have the best opportunity to fulfill this desire. The emission and free circulation of financial assets contribute to the implementation of such aspirations, providing broad opportunities for manipulation in the stock market. Modern market makes it possible to fix income and profit not only in the form of dividends, interest and rental payments, but also as a part of the unsecured increase in the value of financial assets.

The possibility of additional income receipt, as a result of the issuance and circulation of financial assets, has always been attractive to enterprising businessmen. We propose below a brief historical analysis of the struggle of liberal financial institutions against the state for their free access to the emission and turnover of financial assets. The analysis shows that financial institutions in recent decades have a clear advantage in this struggle, while the rest of society suffers from this.

Commodity money

Historically the money is the first financial asset that has free circulation. The first money was commodity money, most often metallic. Initially their purchasing power has been provided by the value of the metal contained in the coin (gold, silver, copper). As a rule, the value of commodity money in a market economy corresponds to the cost of their production. Therefore, there should not be a substantial difference between the nominal and real purchasing power of such money. Although, in the short term such a difference may occur; for example, it was actually observed when the production cost of monetary metals reduced after the finding of the

[31] Quotation from the poem by V. Mayakovsky "Listen!"

silver mines in America. Nevertheless, the purchasing power of commodity money was quite stable in the long run, (Keynes, 1936).

Since the difference between the nominal value of money (the amount by which the coin had to be accepted as a means of payment) and their real value (the cost of the monetary metal contained in it) has the right to exist, the issuer has the temptation to use this difference for gaining profit: to spoil the coin, facilitating it and/or lowering the content of the monetary metal. The spoiling of a coin, in pursuit additional income, creates a difference between its nominal value and the value of the monetary metal contained in it. This difference is similar to the difference discussed above between the market value of a financial asset and the amount of obligations corresponding to this asset. Particular entities have the opportunity to obtain the unsecured financial income due to such a difference. However if you ease the coin significantly, it will immediately lose its purchasing power (market value). Market participants will seek to get rid of such a coin, this will reduce its market value; it is a kind of inflation. Therefore, the scale of the benefits from spoiling money cannot be great. The ancient "financial markets" could not provide a large amount of profits.

Fiat money

The most important shortcoming of commodity money is their high production cost. The society is forced to spend a part of its resources on "*digging holes in the ground known as gold-mining, which not only adds nothing whatever to the real wealth of the world but involves the disutility of labor*" as Keynes (1936) claimed in his famous treatise. The subsequently appeared fiat money solved this problem. Such money is a financial asset in the full sense of the word, the same as bills of exchange, bonds, debt receipts, receivables, etc.

The history of the appearance of the fiat money is very interesting and multifaceted. First of all, the use of metallic money was inconvenient in the international trade. Transportation of such money was associated with costs and with the risk of loss. Therefore, one of the first versions of fiat money was a receipt of a person who accepted gold for safekeeping (let's call him a banker). This is something similar to modern traveler's checks. By submitting this receipt to a banker's trustee in another country, it was possible to receive gold without the risk associated with its transportation. The issue of a receipt in this case meant 100% reservation of the gold equivalent. The use of such receipts was convenient, so they could directly serve as a means of payment instead of metallic money. Therefore the bankers were tempted to issue more receipts/banknotes than the available reserve coverage of gold. Such activity is beneficial for the banker; for example, he can lend the issued banknotes to receive interest income. The emitted financial assets (banknotes) in this case have a specific issuer (the banker), who is simultaneously their guarantor. He has an obligation to give on demand an equivalent amount of gold in exchange for the banknotes presented. Therefore, a conscientious banker should have a significant gold reserve.

Historically the emission of banknotes was carried out not only by private bankers, but also by the state. This was done for several reasons: because of convenience; due to the physical shortage of metal money in a rapidly growing economy; to cover the budget deficit, etc. The state also guaranteed to exchange the issued banknotes for metallic money on demand. The fiat money was emitted either directly by the state (as in ancient China) or, more often, through a state bank that makes it by money lending. The banknotes thus issued were required to be accepted as a means of payment.

Both in the case when banknotes were issued by a banker, and when it was done by the state, the quality of such financial assets depends to a large extent on their assurance, that is, on the reliability of the issuers. Sometimes the desire to get more benefit pushed the latter towards a recklessly large emission, which, as a rule, led to the discrediting of the corresponding fiat currency. If the assurance insufficient, then the banknotes had to lost their value. In the hard version, this could be accompanied by the bankruptcy of the issuer (bank for example). In the soft version this could be followed by a more or less devaluation of fiat money relative to gold. However the loss of purchasing power of a particular fiat currency from time to time did not

have a catastrophic impact on the global currency market. The stability of this market and solid exchange rates of national currencies were provided by the gold standard. Such stability was in the public interest of the whole world society.

In a growing economy, where the gold standard is observed, the amount of fiat money in circulation should grow approximately at the same rate as the aggregate output. Only in this case the real purchase power and the gold content of the money will be unchanged. Indeed, if the money supply does not increase or increases too slowly, then the nominal prices will necessarily decline, that is the national currency unit should contain more gold, which contradicts the gold standard. Then the growth of economy makes it possible to carry out additional emission of fiat money. On the other hand, such additional issue should not be too high to prevent inflation and devaluation of the national currency relative to gold. To avoid negative consequences, the emission of fiat money should be limited. As a result, the banking sector is subject to hard restrictions. Size of safe emission is not significant, if inflation is absent, when the gold standard performed. Calculations show that if the economy grows at a rate of g =0,03 (3% per year), the safe monetary emission size is only s_{emit}=0,006 (0,6%) of GDP per annum. The formula $K/Y=s_{emit}/g$ which was used for the calculation was obtained in Appendix C (see Equations C.4 and C.5).[32]

Such emission provides benefits for the issuers, but not much. Monetary issue of just 0.6% of GDP did not satisfy the appetite of the state and bankers, they want more.

Rejection of the gold standard

After World War II, the US dollar was recognized as the world currency, with a fixed gold content ($35 per ounce). However, soon in the early 1970s, the United States refused to honor the gold standard. Having abandoned this restriction, the US and other countries become able to emit more fiat money than with its abidance. The purchasing power of the dollar stopped being fixed and began to fall. The outcome was inflation. This concept, which has become familiar to us, was absent in the lexicon of economists until the middle of the 20th century as unnecessary. Prices could vary during the era of gold standard, but on average they had to remain stable relative to the price of gold. Keynes (1936, 21st chapter) stated the stability of prices (in gold equivalent) over the past 150 years, citing the weak volatility of the now long-forgotten Sauerbeck (1895) index, which characterizes the purchasing power of commodity money.

The absence of the issuer's responsibility for purchasing power of the money emitted became a new feature of modern monetary emission. In the world with the gold standard the banker had to exchange the money he had issued for gold at the fixed rate. Gold has a fairly stable purchasing power; therefore, the financial asset issued in the form of fiat money had reliable assurance. Nowadays a monetary emission has not such guarantee. The bank-issuer can be specified on the modern banknotes, but this bank is not responsible for their purchasing power. The corresponding liabilities are reflected in the balance sheet of the bank at a nominal value without binding to gold or other commodities.

Therefore, looking back at the era of gold standard, we can say that the modern fiat money is secured much worse; the issuer cannot always ensure the stability of its purchasing power. The emission of fiat money after the rejection of the gold standard can be compared to the Milton Friedman's helicopter (a helicopter that throw about the money is the favorite device of the founder of monetarism to explain monetary phenomena, primarily inflation). Although, strictly

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[32] It is shown in Appendix C that this formula, which is analogous to the Harrod-Domar equation, holds for any type of assets accumulated at a constant rate in a growing economy. When calculating, it was assumed that the required amount of liquidity in GDP units was K_{emit} /Y=0.2; indeed, actual checkable deposits and currency in the US averages 0.2-0.25 of GDP (see Excel file attached "Statistical Data", row FL793020005.A); Friedman (1956) estimated the average (psychologically inherent in a person) need for liquidity even less: approximately about 0.1 GDP. For the countries that issue the "world" money, first of all for the US and for the EU, the safe size of the money issued can be significantly higher.

speaking, the modern issue of fiat money is "almost", but not exactly Friedman's helicopter. Money from the helicopter appears out of nowhere. But the monetary issue is necessarily accompanied by appearance of corresponding liabilities (deposits) in the balance sheet of the bank-issuer. All modern fiat money appears due to the emission of a bank loan; while the net assets of subjects do not change. Two inverse items: an asset and a liability simultaneously appear in the balance sheets of both the bank and the borrower:

Table 4 *In the bookkeeping system of the bank*

Account Debit	Account Credit	Sum
Loans issued (asset)	Deposits (liability)	$2500

In the bookkeeping system of the borrower

Account Debit	Account Credit	Sum
Cash (asset)	Bank loan received (liability)	$2500

Of course, the issue of fiat money is accompanied by the potential danger of instability. The bankruptcy of an individual bank and the resulting panic can crush the entire banking sector. In addition, not all borrowers initially intend to repay their debts, and this is not always due to their unfairness. The government can consciously increase total borrowings to finance the budget deficit, without planning pay off debts (old debts are being paid off by issuing new ones).

However, the lack of assurance (compared to the period of gold standard) does not prevent modern money from fulfilling its functions. The issue of such money itself does not lead to instability. If all is well and the borrower repays the bank loan, then the initially arising assets and liabilities will be mutually eliminated.

The possibility of relatively safe permanent emission of fiat money in a growing economy in the presence of inflation led to the fact that the modern budget policy of most states implies a permanent budget deficit. These governments usually do not plan to repay its debts in the foreseeable future which would require limitation of government expenses in order to form the budget surplus. It is really not necessary to pay off these debts, because the state, as a rule, takes money from himself (usually, the national bank buys bonds of the ministry of finance). The liabilities to pay off the debts exist, but the debtor (the state) is not going to fulfill them on the merits, and the creditor (the national bank) is not going to demand repayment. This is more like a Friedman helicopter. Therefore, as a rule, the modern fiat money is a low secured financial asset, despite the fact that the issuing bank has a corresponding liability; such liability usually is perfunctory.[33]

According to the monetarists' approach which we share in this case, the additional issue of fiat money at a faster pace, compared to the growth rate of real output, leads to inflation. The deficit of the state budget, as a rule, is connected with an additional issue of fiat money. Therefore the prudent governments limit the budget deficit and the corresponding money issue, in which case inflation is within "reasonable limits".

At present, inflation within "reasonable limits" is already considered as a boon. We believe that it is really a boon, but mostly for issuers of money receiving benefits from such an issue. The more is monetary emission, the greater become the inflation.

Due to the inflation the government is able to more widely and safely use the monetary emission mechanism, to cover the budget deficit. Calculations using the formulas C.6 and C.7 in Appendix C, show that after the gold standard have been rejected, the safe volume of monetary

[33] However, the issue of fiat money may be secured, for example, when a national bank buys foreign currency to replenish its foreign exchange reserves. Crypt currency and similar "money" do not have any security in the form of any liabilities.

emission could be increased at least twice, up to 1.2% of GDP per annum (if a real output growth of 3% will be accompanied by inflation of 3% annually).
Thus, although the issue of fiat money was increased after the rejection of the gold standard, it still remains within certain limits. Therefore the amount of financial benefit, which is received as a result of such emission, is limited also, while the capitalists always want more.

Issue of financial assets

The unsecured financial income can be obtained not only through the money issue, but also through the issue and circulation of other financial assets.
Here we would like to draw an analogy between the fiat money and financial assets in general. Fiat money does not really have any intrinsic value, but is only a confirmation of the debt of the society to the owner of this money. Money is a "promissory note" which is unconditionally accepted for payment (more precisely for exchange for goods) by all members of society. The other financial assets, as a rule, have lower liquidity and can be exchanged for goods with certain restrictions. Money is sometimes perceived as more than an ordinary financial asset at the expense of its excess liquidity. However this is a delusion. Indeed, money is accounted for in the system of national accounts on an equal basis with other financial assets. For example, the consolidated balance, considered in Section 2, is not affected by events such as debt repayment. One type of financial asset (buyer's receivables) is transformed into another (money).
Money is mandatory to receive as a means of payment. This is different from other categories of financial assets. The consequence is the maximum liquidity and attractiveness of money (the term liquidity is often used as a synonym for money). However, the electronic trading platforms for securities brought great changes, especially with the advent of the Internet. These platforms provide an opportunity to almost instantly buy or sell marketable securities. Therefore, the liquidity of such assets today practically does not differ from the liquidity of money. Thus, the issue of stock market instruments does not differ significantly from the issue of fiat money. The common term "Cash and cash equivalents" nowadays includes both cash and marketable securities which can be converted into cash immediately. In this regard, there is even a new term appeared: "shadow banking."
The shadow banking associated with the issue and circulation of highly liquid exchange-traded financial assets on the financial markets; it is similar to traditional banking, associated with the processes of issuing and circulating of the fiat money. The outcome of market pricing of financial assets may be the emergence of an unsecured increase in the value of assets, that is, unsecured financial income. It was demonstrated in Section 5, where stocks were considered as the financial assets. Unsecured income differs from secured income by the fact that the first one has no "roots" in the real sector of the economy, that is, it is not related to the value added which is created in this sector.
The value of any financial asset must be secured by the counterpart obligation. So far we considered the most common types of assets: shares and bonds. The shares are secured by issuer's revenues and by own capital. Bonds are secured by the obligation of the debtor-issuer and, ultimately, by his income and wealth. When a financial asset is emitted, and its primary placement occurs, the value of this asset is equal to the amount of the relevant obligations of the issuer. However this binding can be broken later, as it is described in Sections 4 and 5 above. As for bonds, the difference between their current market value and the value of the corresponding issuer's liabilities is relatively small and temporary (this difference is to be nulled at the time the bond is redeemed). The situation is different with the issue and circulation of shares.

Issue of shares, merger and acquisition procedures

Theoretically, the market value of shares can strongly differ from the issuer's own capital. This allows you to generate a significant amount of unsecured income. Therefore, the considered financial instrument is attractive for players in financial markets. Until the last decades the shares was the most common financial instrument used for earnings in the financial markets.
A side effect of these earnings is the process of inflating financial bubbles, accompanied by a decline of stability of the economy and by an increased probability of a crisis. Corresponding

negative experience has already been accumulated, as evidenced in Figure 2 by the correlation between the two curves characterizing stock market prices and the change in economic growth rate. The outcome of this negative experience previously obtained is a more cautious attitude of stock market participants towards the prospects of growth of overvalued shares. Ordinary traders do not always believe the fantastic prospects of modern "Companies of the Indies" and are cautious if the stock market is overheated, which is easy to detect. The evidence of overheating of the market is the excessive and unsecured shareholder value of enterprises. And in order to calculate the share of unsecured value of equities, it suffices to compare the shareholder value and the equity of corporations.[34] Such a comparison is shown in Figure 1 across the entire US economy; the figure demonstrates that shares were the most overvalued in 1999, on the eve of the stock market crash. The caution of many stock market participants limits the ability of speculators to make money via the financial instrument under consideration; this prevents their desire to maximize profits.

However, the attractiveness of the shares for speculators is not limited to the possibility of forming a new unsecured income. To obtain additional income, the price volatility of these securities can be used. Such volatility is intrinsic to stock prices due to the instability of the latter in modern stock markets, where the boom inevitably follows by a recession. In this case an additional income can be obtained as a result of the redistribution of wealth between households. The process is similar playing in a casino, where lucky or well-informed speculators benefit, while the rest of the participants lose. Such a process depends on the amplitude of stock price fluctuations; and this amplitude is limited by the caution of the stock market participants. Again, an obstacle arises that prevents aspirations to maximize income, and again enterprising businessmen find it possible to get around it.

It turns out that the volatility of shareholder value, which is necessary for the effective redistribution of wealth, can also be organized without a nominal violation of the law of conservation of wealth, that is, without the growth of Tobin's q-factor. This is made possible by a creation of specific corporate ownership structure, which we called here as "entangled", when the enterprises are cross-owned from each other. In this case, the shareholder value can change significantly without objective reasons, while continuing to correspond to the issuer's own capital. As a result, this instrument of redistribution of aggregate wealth and the possible cause of instability turns out to be hardly noticeable. Such entanglement can arise as a result of mergers and acquisitions made to increase the capitalization of corporations. By way of example, in Appendix B two corporations are considered which have become interconnected after the stock swap. In this instance, an entangled ownership structure appears, when the first enterprise owns the shares of the second one, and the second enterprise owns the shares of the former. It turns out that entangled structure of ownership causes the instability of the shareholder value of the enterprises under consideration. The price of shares may grow without control, while the shareholder value correspond to the value of the issuer's equity, that is, the law of conservation of wealth is not violated even in nominal terms. So, even the adaptation of the cost approach for financial assets valuation is not always able to prevent the negative consequences of the modern stock market activity.

Financialization of the economy

Shares are a traditional instrument to obtain financial gains, but the opportunities for using of such tool are limited, as it was noted above. At the same time not only stocks can be successfully used to maximize financial returns. Modern talented financiers have invented many other financial instruments, the essence of which is very confusing, especially derivatives, futures, hedge funds shares etc. These instruments often provide very high returns, and are also an attractive financial instrument for an "alternative investment". Similar to stocks, market prices of such assets can also display significant fluctuations, which are used by stock speculators to make a profit. It turns out that financial profit can be additionally obtained through unsecured income,

[34] The ratio of these two quantities is often called "q-factor" introduced by Tobin (1981).

which forms unsecured wealth. Like stocks, the volatility of the market prices of other financial assets also may also be accompanied by a deviation of the value of this asset from the value of the corresponding obligation in the issuer's balance sheet. In this case, the part of such asset's value may not be secured by the issuer's obligations.

The total unsecured wealth can be revealed by comparing the total values of financial assets and financial obligations securing them. However, some types of financial instruments complicate the consideration, and we will exclude them from it. Firstly, these are stocks and ownership in noncorporate business. These assets are secured by the own capital of the enterprises.[35] Secondly, we exclude monetary gold from consideration. This asset is commodity money, the value of which is provided directly by the value of gold.

All financial instruments remaining under the consideration have a common property (which is not inherent in excluded instruments). These financial assets are secured exclusively by financial liabilities in the balance sheets of their issuers. For example, bonds are backed by the issuer's financial obligation to redeem them. Therefore, it is easy to detect and measure the unsecured wealth associated with the presence of such financial instruments by comparing the total volumes of the respective financial assets and financial liabilities on the balance sheets of all economic entities. This was done for the US economy using FOF accounts. We summed up the value of net financial assets (the difference between the values of financial assets and liabilities) for all sectors of the economy. The amounts of corporate shares, own capital of noncorporate business and monetary gold are excluded from the aggregate value of financial assets. The result is shown below in Figure 5, curve (♦).

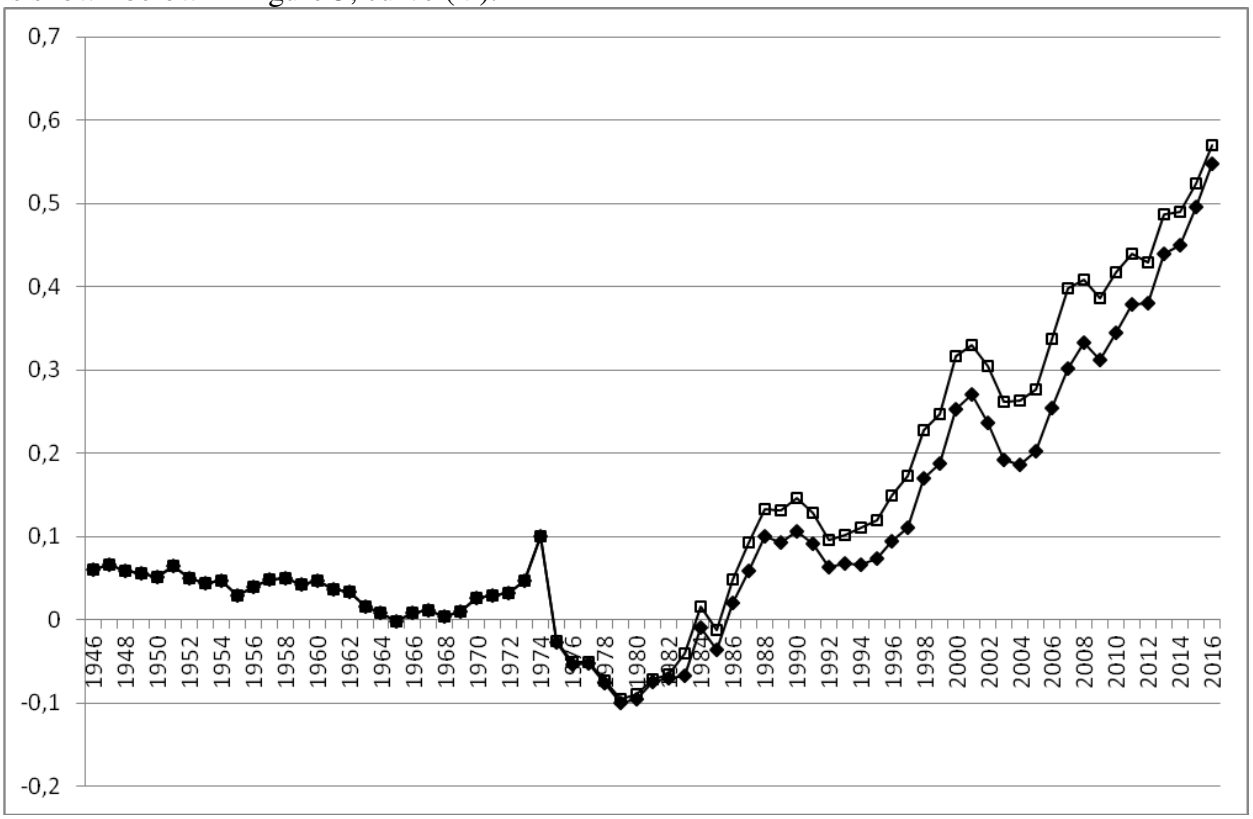

Fig 5 USA. The total net value of financial assets in units of GDP aggregated across all sectors of the economy, excluding equities, ownership of unincorporated businesses and monetary gold, (♦); The value of "Instrument discrepancies" between the value of assets and liabilities in units

[35] The formation of unsecured wealth due to the difference between shareholder value and corporate equity has already been discussed in detail in Section 5. Property rights value of noncorporate business is always equal to the own capital of the enterprise; unsecured wealth cannot arise there.

of GDP, aggregated across all types of financial instruments (except for equities, ownership of unincorporated business and monetary gold), (□). Data Sources are in Appendix G.

Curve (♦) shows the rapid growth of the unsecured part of the value of financial assets under consideration; this value has been already exceeded 0.5 GDP in the US economy in 2016 (over 11 trillion dollars).[36] Such growth is confusing. Indeed, theoretically, for all financial instruments under consideration, the difference between the value of financial assets and the corresponding financial liabilities should not arise at all, not only at the time of issue, but also subsequently. That's why such a difference is called "instrument discrepancies" in the FOF accounts. To check the accuracy of the calculated difference between the sum of financial assets and liabilities, which is shown on the graph (♦) we calculated the total sum of discrepancies for all the instruments considered here. The result is shown by a curve with a marker (□). Both curves in Fig. 5 practically coincide, which is quite natural, because we calculate the same variable in two different ways. The coincidence of the curves indicates that the potential error is small.
The figure shows that there are not enough issuer's financial liabilities for the existing financial assets. The magnitude of such discrepancy is so large that it can hardly be interpreted as an error. Therefore, we are confident, that in fact the figure shows the growing amount of unsecured wealth generated by some financial assets other than stocks (unsecured wealth related to stock price volatility is excluded here).
If we analyze what financial instruments form such a discrepancy, it turns out that almost all of them are so-called "miscellaneous financial assets", which are not identified. Simply put: the discrepancy exists, but its cause is unknown exactly. And another interesting observation: the most of unidentified miscellaneous assets and liabilities belong to nonfinancial corporations.[37] It seems that enterprises in this sector are heavily involved in financial speculation, which can significantly distort their own capital value.
Figure 5 demonstrates non-compliance with the law of conservation of wealth in nominal terms, as well as it was discussed above with regard to shares. This can be imagined as if the part of the financial assets' value appeared not together with the corresponding obligations, but "out of nowhere" - from the Friedman's helicopter. This part of the value of such assets is not secured by any obligations. The situation looks absurd, nevertheless it takes place. And if the existing difference between the shareholder value and the issuer's equity is somehow trying to explain (talking about synergy, human capital, know-how, etc.), then a similar difference for the miscellaneous financial assets is called as the discrepancy of statistical data. This again confirms our statement about illegitimacy of the difference between the real value of the financial asset and the value of the corresponding obligations. We believe that in the case under consideration the law of conservation of wealth is violated also only in nominal terms. Taking into account the potential inflation, the real value of wealth is equal to the total value of nonfinancial assets.
Emission of financial assets is not controlled as strictly as money emission. As a result, financial dealers have complete freedom to issue new assets. The outcome is an abundance of new financial instruments. The trade in overvalued assets is flourishing on modern electronic trading platforms. These are: forex deals on currency markets, commodity futures, and all kinds of options and so on ... The trade volumes significantly exceed the value of actually existing

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[36] The initial data for Fig. 5 were taken from the FOF accounts statistical release for September 2017. To our surprise, due to a change in the methodology, a later release (for December 2019) shows a completely different picture. Not only the shown in the figure difference (discrepancies) between the total value of financial assets and related liabilities has been fundamentally changed. At the same time, the own capital of nonfinancial corporations decreased one and a half times (and after all, these entities undergo an annual mandatory audit!). An analysis of this "detective story" is carried out in Appendix F.

[37] This is evidenced by the series FL893193005.A; FL103193005.A; FL893093005.A; FL103093005.A in FOF table L234 (unidentified miscellaneous assets and liabilities), see the file "Statistical data".

physical assets. Confirmation of this is the observed rapid growth of aggregate financial assets volume in the recent decades, reflected in Figure 6 in GDP units (curve with ▲ marker).

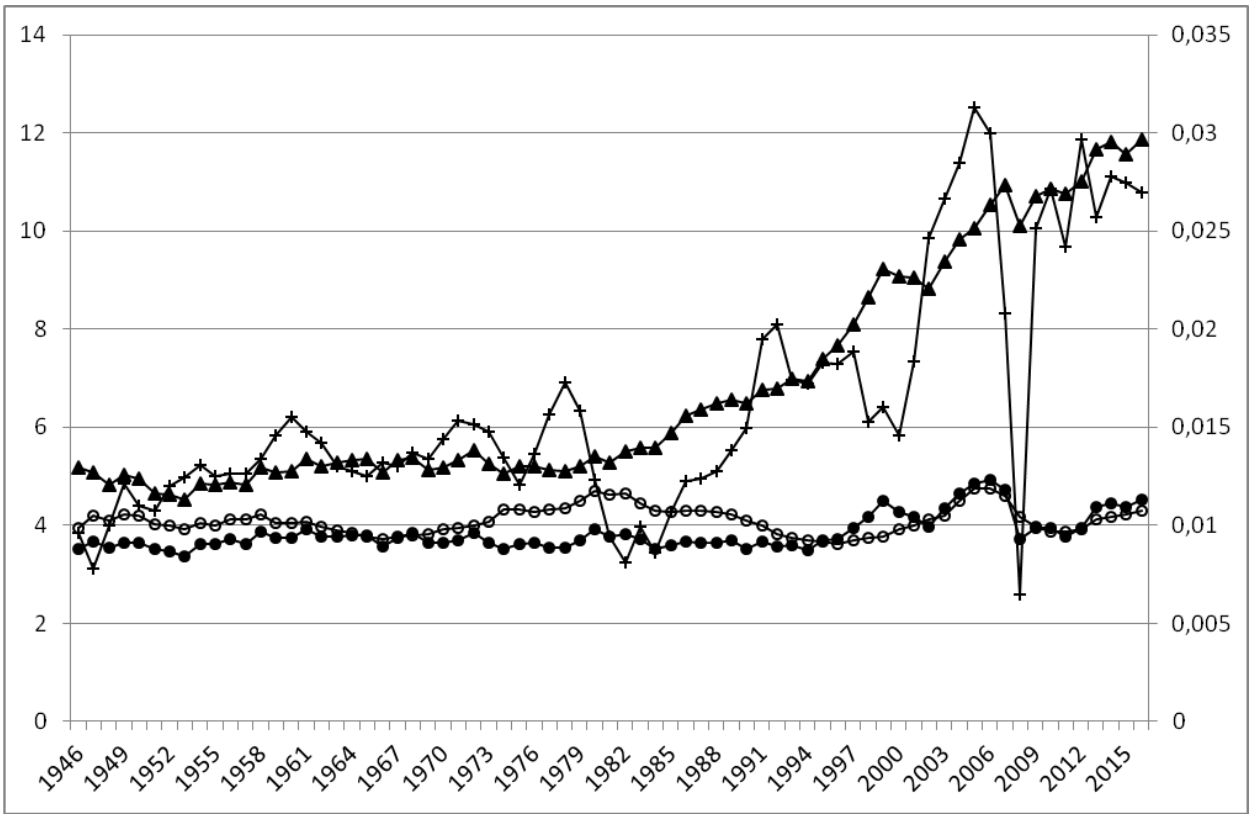

Fig 6 USA. The ratio of total value of financial assets to GDP (▲);The ratio of total wealth to GDP (●);The ratio of total value of nonfinancial assets to GDP (○);The ratio of profits of financial business to GDP, right axis scale (+). Data Sources are in Appendix G.

At first, Figure 6 shows a tolerable correspondence between the total volume of nonfinancial assets and total wealth (curves with ○ and ● markers respetively).[38] That is, with a certain accuracy, the law of conservation of wealth is observed in nominal terms. Secondly, the figure shows that until the mid-1980s, the existing volume of financial assets (▲) was virtually unchanged, as well as the volume of aggregate wealth (both are in units of GDP). Apparently, just such ratio between the total volumes of financial and nonfinancial assets is necessary for the normal functioning of the economy. It can be seen that the total value of nonfinancial assets (in GDP units) has not changed significantly since the 1980s, so we see no reasonable grounds for an increase in the volume of financial assets. There is an opinion that the more financial instruments and financial assets, the better for the economy. Such abundance allegedly gives new opportunities to business. If that were true, the growth in the volume of financial assets would facilitate the accelerated growth of the aggregate output. However, the accelerated output growth during the period of intensive growth of financial assets (after the 1980s) is not observed, rather the reverse.

We believe that the reason for the explicit growth in the volume of financial assets is the acquisitiveness of capitalists. There is no limit to human ingenuity, if it brings benefits. The emergence of the Internet in the 1990s made it possible to increase the liquidity of financial assets and increase their volume. A larger volume of assets will generate greater profits. Indeed, the curve with markers (+) in Figure 6 demonstrates that despite volatility, the profit of the financial sector is growing along with the growth in the volume of financial assets.

[38] By total wealth we mean here the value calculated in Table B1 FOF.

9. Conclusion remarks

So, capitalists are seeking to maximize their profits by any available means. We believe that the current liberal tendencies actually untie their hands, and that is the cause of the existing problems in the modern economy, including the last 2007-2008 global financial crisis. The abundance of various financial instruments freely emitted and traded in modern financial markets provides capitalists with the opportunity to receive huge amounts of financial income. A significant part of such income is generated due to the increase in the market value of financial assets. The growth in the value of a financial asset is not always ensured by the growth in the value of the corresponding obligations. Each financial asset must correspond to certain obligations ensuring it in the balance sheet of the issuer of this asset. The increase in the value of financial assets may exceed the increase in the corresponding obligations due to the functioning of modern stock markets.

In the presented research we call as unsecured and illegitimate such excessive (relative to the increase in the issuer's obligations) increase in the value of financial assets, as well as the corresponding financial profit. The statement about their illegitimacy is based on the fact that unsecured profit has no roots in the real sector of the economy. After all, the original source of total income, including profit, is placed in the real sector of the economy, where value added is created, which forms GDP and national income.

Unsecured part of the value of financial assets and unsecured income are the source of the emergence and growth of unsecured wealth (the difference between aggregate wealth and the total value of nonfinancial assets for a two-sector economy). Unsecured wealth is also considered as illegitimate: we are confident that the real value of national wealth should be equal to the total value of nonfinancial assets; this equality is called here “the law of conservation of real wealth”. The exsistance of unsecured wealth indicates a deviation of the nominal value of wealth from real one, that is, is a potential source of inflation and of finuncial bubbles.

Redundancy and illegitimacy of unsecured income and wealth is also confirmed by the methodological paradox described by us above. Haig – Simons individual households' income includes, among other components, the financial gains and revaluation of financial assets. Total income calculated in this way is not necessarily equal to the total expenditures in the real sector; such equality takes place only in the absence of unsecured income. Similar statement is also true regarding the equality of aggregate savings and investments. Non-zero unsecured income indicates the inequality of total savings and total capital investment. This makes impossible simultaneous and correct recording of income and stocks in the system of national accounts.

Unsecured incomes inflate a financial bubble, the size of which corresponds to the value of unsecured wealth. Such a bubble should burst sooner or later, because the boost of the stock market is inevitably followed by its collapse. This is does not contribute to the sustainability of the economy, since fluctuations in the stock market can cause fluctuations in total capital investment and output in the real sector.

But this is not the only negative consequence of the growth of unsecured income and wealth. As we had shown in the subsection 7.5 (see Theorem 1), the unsecured income and the growth of unsecured wealth inevitably entail outpace growth of the largest fortunes and an increase in wealth inequality. So, the inequality strengthening appears as a “side effect” of the growth of unsecured wealth in the modern economy. This raises two debatable issues. The rising inequality is a problem for the economy or a boon? And is the functioning of stock markets harmless, resulting in unsecured income and rising inequality?

Most economists understand the abnormality of deviations in the value of financial assets from the obligations securing them (for example, deviations in the value of shares from the issuer's equity capital). However they do not pay attention to these anomalies, considering them as temporary phenomena. Indeed, the value of financial assets may return to its previous level after the boom in the stock market, but the wealth inequality that has grown as a result of the unsecured wealth that has arisen during the boom is irreversible and will not return. Moreover,

statistics show a permanent increase in unsecured wealth, see, for example, Figs. 1 and 4 for the United States. The fight against rising inequality has no prospects without imposing severe restrictions on the operation of modern financial markets.

However, a number of economists do not consider the fight against inequality as a priority task. Proponents of this view recognize that greater capital gains mean lower wages, which means redistribution of total income in favor of wealthy capitalists and rising inequality. However they believe that the higher profits on the other hand, will lead to more capital investments, and then to an accelerated growth of labor productivity, wages and the economy as a whole. Really, a large amount of profit increases the concernment of owners in business development and therefore should contribute to the growth of investment and aggregate output. In addition, the large profit of the capitalists means their great savings. And big savings should automatically mean big investments by virtue of the accounting identity of total savings and investments. In this case, the concomitant increase in inequality may not be very important, since the damage that the rising inequality brings will be overcovered by the benefits of accelerated economy growth. As a result, poor households eventually will also benefit, since the increase in their wages due to accelerated growth in labor productivity will exceed the damage associated with an increase in the share of profits in total income.

We believe that the above logic really may be relevant, but only for successfully developing economies, where profit generated in the real sector is fully reinvested in the same sector, ensuring rapid growth in labor productivity and aggregate output. But such logic does not work in modern developed economies, where a significant portion of the profits are generated in isolation from the real sector, and is the unsecured income. Such profit is absorbed by unsecured growth in the value of financial assets and do not stimulate capital investment in the real sector and the economic growth. On the contrary, capital investment often turns out to be unattractive when the returns on financial assets are high, which leads to their crowding out to the financial sector. The yield of alternative financial investment can reach 10% or more, as Piketty (2014, ch.12) noted.

One can argue about to what extent the capital market is perfect, but it is obvious that the profitability of financial assets and the return on investment in the real sector of the economy should be linked. Then the increased revenues in the financial sector (also due to the revaluation of financial assets value) should lead to a greater return on investment in the real sector of the economy; otherwise such investment will be unattractive. Indeed, why one will invest in fixed production assets, if the return on assets in the financial sector is higher with the same risks? The requirement for a high return on investment in the real sector can lead to its reduction and displacement into the financial sector. Thus, the growth of unsecured financial income can lead to a reduction in investment in the real sector.

In this case the total investment does not have to be equal to the total savings; their accounting identity may be nominally violated, as we noted above. Therefore the large savings of the capitalists, resulting from their huge profit, are not necessarily fully reinvested in the real sector. Part of these savings which corresponds to unsecured income and has no roots in the real sector is absorbed by an increase in the unsecured value of financial assets (an increase in unsecured wealth). It was demonstrated in Section 6 that the excessive profit arising in the financial sector $r_f K_f – r_n K_n$, which we interpret as unsecured income, is automatically equivalent to non-consumed and not reinvested income $S_f – I_{net}$, see Equations (15) and (16). Thus, due to unsecured income large capitalist savings may well take place simultaneously with low capital investment.

In turn, the low investment means the slow productive capital growth. As a consequence, labor productivity growth and the possibilities of GDP growth from the side of aggregate supply are weak.

On the other hand, an increase in the return on capital limits the possibilities for GDP growth from the side of aggregate demand. Indeed, the higher rate of return on capital r along with the observed constant ratio of capital to output of K/Y (curve ○ in Fig 6) means the higher profit share rK/Y in the aggregate income. The higher share of profits should automatically means the

lower share of wages. The low wages means the relatively weak total effective demand from workers. The decline in consumer demand of workers is not fully offset by the growth in consumer demand of wealthy capitalists. After all, as the income of the latter is growing at a faster pace, they will have to reduce consumption share. As a result the growth of aggregate consumer demand is inhibited. This further contributes to a decrease in appetite for capital investment in the real sector of the economy.
Inhibition of aggregate demand simultaneously with inhibition of aggregate supply (due to lower capital investment) inevitably entails slowdown of economic growth.

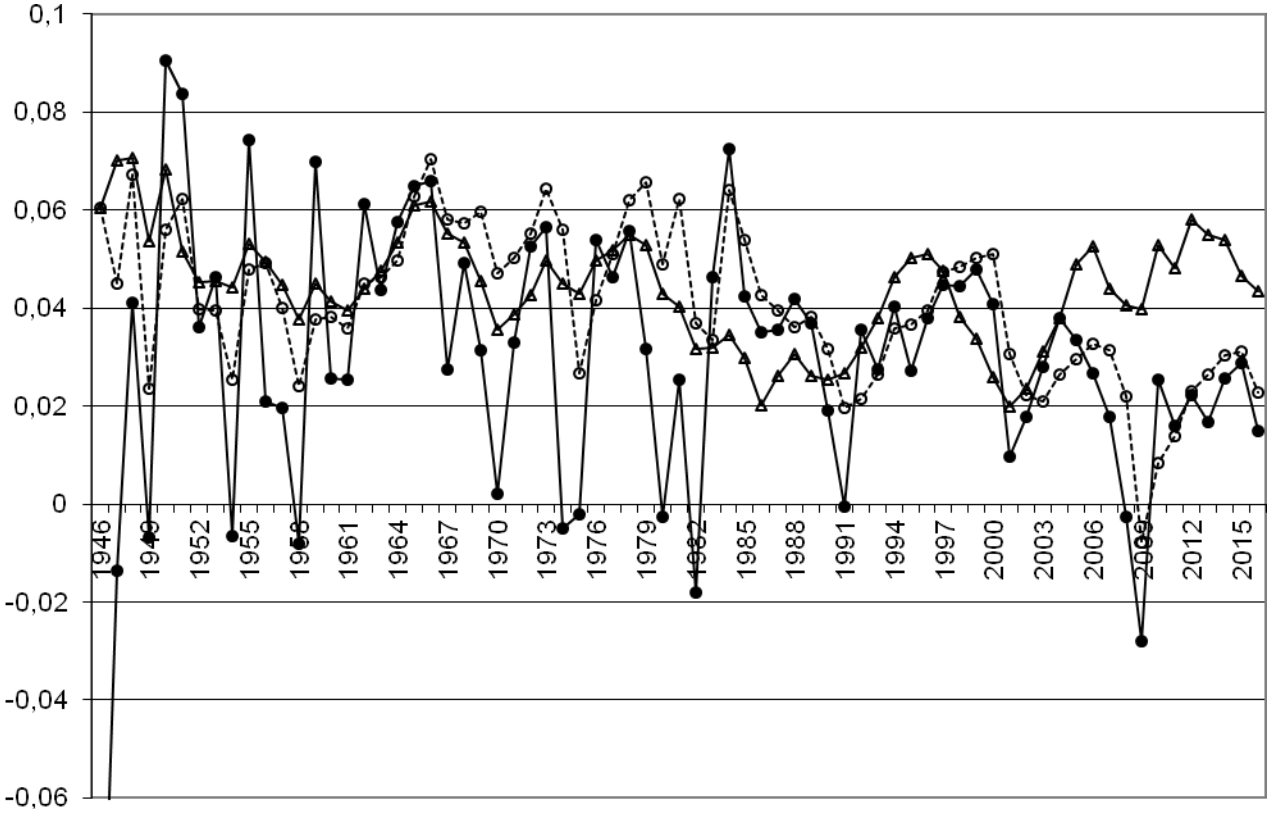

Fig 7 USA. Return on equity for nonfinancial corporate business (Δ); Net capital investment changes/GDP (○); Growth rate of the aggregate real output (●). Data Sources are in Appendix G.

The trends theoretically described above are observed actually, particularly in the USA, see Fig 7. The high rate of return on capital (curve Δ) in XXI century is accompanied by a meager amount of investment in the real sector (curve ○) and a meager growth of real GDP (curve ●).
We believe that the observed low growth rate of the aggregate real output, and the low growth of the total investment in production capital are the outcome of the animal spirits of capitalists, of their unbridled desire to maximize profit. This desire is realized primarily through the financial sector, resulting in damage to the real one. Therefore, the dilemma "either profit and rapid growth of the economy, or a fair distribution of income and its slower growth" is absent for a modern developed economy. A large financial profit not reinvested in the real sector harms both economic growth and the fair distribution of income.
Anyway, by the 21st century the capitalists managed to achieve their goals in the financial markets, which allow them to take all the benefits from economic growth, and even more. Indeed, Figure 6 shows an increase in the volume of financial assets and an increase in financial profit. Figures 1 and 5 show the continuing growth in unsecured financial assets. However this does not benefit the economy as a whole. Emerging unsecured value of financial assets forms new financial bubbles. This leads to the instability of the economy, to the collapse of stock markets, and initiates crisis phenomena in the economy (see Fig 2). The slowdown of the real

sector of the economy and the growth of unsecured wealth occur simultaneously with the increase in inequality (both property and income, see Picketty 2014, Fig. 1.1 and 10.5 for the US), which corresponds to our theoretical conclusions.

In Section 7 we received one more theoretical conclusion: the increase in inequality should lead to the redistribution of wealth of poor households in favor of the rich ones, up to the bankruptcy of the poorest. The net lending to poor households (Fig. 4) testifies precisely to such a process.

Thus, the theoretically predicted negative phenomena (inflation of financial bubbles, rising in inequality up to impoverishment and bankruptcy of the poorest households, and slowdown of economic growth) have actually occurred in the past few decades. All this is a consequence of the violation of the law of conservation of wealth in nominal terms in modern developed economies. The nominal non-compliance of the mentioned law, in turn, is a consequence of the capitalists' striving for maximum profit, which is realized through their activities in the financial markets. So, capitalists' unlimited thirst for profit ultimately leads the real sector of the economy to a dead end. To achieve the goal, they make financial markets serve themselves, generating their unsecured profit, which simultaneously inflates financial bubbles. The inevitable consequence of unsecured income is the rising inequality which, in turn, slows down economic growth and causes the bankruptcy of poor households. The modern economic policy actually encouraging the above trends cannot be explained rationally. This can be explained only by the irrational, unlimited "animal spirits" of the capitalists.

Thus, the fatal role of modern financial markets is evident. Precisely the functioning of these markets leads to the appearence of unsecured income and wealth, which in turn cause big problems in the economy. Therefore, the operation of modern financial markets is not innocuous and neutral, as many economists believe.

A recent mortgage crisis of 2007-2008 is an illustration to what was said above. Trade in residential real estate has always been existed. And, as a rule, the price of such real estate more or less has been corresponded to the economic costs of its construction. If the market value of housing rises above its economic costs, due to an unforeseen increase in demand, then increased profitability should stimulate the additional new construction. The increased supply after some time should compensate for the increased demand and the price should return to the economically justified level.

All have been changed because of someone’s "bright idea" to emit mortgage-backed securities (bonds) that was guaranteed by the property rights to real estate, including which was not yet built. These securities have been traded on modern electronic trading platforms. Their high liquidity and high yield have raised demand for them, provoked an unprecedented rise in property prices and formed a huge housing bubble. It seemed that a benefit was received by everyone. Such benefit has been provided by the speculative growth in the value of securities, based on expectations. A huge mortgage-backed securities bubble burst in 2007-2008. The imaginary wealth in the form of the excess and unsecured value of financial assets has evaporated. It can be noted that the capitalists were almost not affected: their profit decreased very slightly and not for long (see the curves with the Δ marker in Fig. 7 and the + marker in Fig. 6).

Such kind of story has happened before. Trade in bulbs of elite tulips in Holland in the 17th century was a normal phenomenon. The problem arose when this trade was transformed into futures trading, which often were unsecured papers. The trade in real estate also was a normal phenomenon until it was transformed in the XXI century into trading in mortgage-backed securities. As soon as the uncontrolled emission of financial assets becomes possible, which have had a free circulation in the stock market where the price of those assets is determined, and then the people appear who start using it for their own benefit. At that time they can claim that the benefits appear because of a "non-zero sum" and so on. Allegedly, the emergence of new financial instruments gives some additional impetus to the economy. However we do not have statistical data confirming these statements. It seems to us that such viewpoint is erroneous and intended to justify the legitimacy of the processes taking place in modern financial markets, in

particular, the growing financial profit, which often is not related to economic activities in the real sector. After all, the initial source of total income, including profit, is in the real sector of the economy, where value added is created. Stock speculators were condemned by the society 150-200 years ago, but today they are proudly called "investors". As a rule, the benefits received by main financial dealers bring troubles for the rest of society.

The assertion that the deviations of the value of financial assets from the value of the corresponding obligations are the cause of the redistribution of income and wealth is intuitively clear. After all, if someone wins (due to the growth of the market value of securities, for example), then someone necessarily loses, and vice versa; in such way the conservation law works in this case. It happens just like in a casino, after all the added value is not created there. The winner is, as a rule, a large financial capital, while its representatives control the roulette wheel rotation in this casino. Accordingly, the rest are losers. And these others can't not to play. The current rate of return on low-risk financial investments (deposits, treasure bonds) is negative. Those who want to keep their savings are forced to buy investment funds' shares or play independently on the stock exchange.

Thus, the modern stock market is a huge gambling house. Let us ask ourselves the question: what is better - try to regulate the activity of this gambling business, prescribing clarifications in the existing rules of the game, while new types of gambling (new financial instruments) are constantly appearing? Or is it better to act more harshly towards such gambling house?

We affirm here that the modern financial markets are carrying on too many dangers and that the emission and circulation of financial assets should be strictly limited. However it does not follow from this that we are opposed to the existence of financial assets as such, including fiat money. The existence of financial assets is necessary and inevitable, since the existence of property rights and acts of borrowing is inevitable. The danger, first of all, is the uncontrolled emission and free circulation of such assets on modern electronic trading platforms.

The main natural and necessary function of financial assets is the distribution and redistribution of the aggregate income among the society members. Consolidated national economy integrates many different subjects: households and enterprises. But eventually all existing wealth is owned by households (if the state and the outside world are not counted). Household within a consolidated economy can differ by their abilities as well as by their propensity to save. Therefore, the values of own capital will also vary for different households. There will be also a difference in what kind of assets they will keep their wealth. Someone will open his own enterprise. Someone will build a palace, buy land or real estate. Someone will deposit money or put them in a glass bank. Everyone will try to get a maximum of confidence and/or income from their wealth in the future.

Let's ask the question: what functions do modern financial assets actually carry out? Do they fulfill the necessary function of income redistribution, or instead, become a tool for gambling? The existence of documents certifying the ownership of the enterprise is necessary only to legally fix the real owners who participate in its management and are entitled to receive corresponding benefits as a part of the value added produced by the enterprise. Does the stocks which are freely traded in the modern financial market, perform this function? As a rule, they do not. Nowadays, when buying shares on the stock exchange, "investor" usually signs a power of attorney, according to which the management of the company votes on the shareholders' meetings on its behalf. That is, while buying shares, he does not want to participate and does not participate in the management of the corporation. Is he interested in, what is the size of value added, and of profit formed by the enterprise, and how much dividends will it pay? Alas his interest is only to the extent that these factors affect the expected value of the shares of this enterprise. Many companies do not pay dividends at all; nevertheless, their shares are successfully traded on the stock market. Modern "investor" now often buys not a stock but indices, that is, packages of shares of various enterprises in a certain proportion. By issuing and

selling shares, the corporation attracts cheap money;[39] while the "investor" acquires a casino chip.

The scale of this casino has been significantly increased in recent decades. Appearance of the Internet not only dramatically increased the liquidity of financial assets traded on electronic platforms. This revolutionary invention allowed participating in bidding for a wide range of people wishing to take risks. Brokers provide them with a leverage service for trading, so that the volume of trades dramatically increased. Casino "financial markets" received a second birth.

Is roulette wheel in this casino spinning on its own, or does someone manage its rotation? It seems to us that the second option is relevant. Enron Corporation went bankrupt in 2001, but for six consecutive years Fortune named it "America's most innovative company". The methods of the exorbitant artificial increase in shareholder value of this corporation were loudly condemned. However the same "innovative" methods of increasing capitalization have been used earlier, and are used nowadays by other successful companies, incl. such giants as Microsoft and others. The most common methods are mergers and acquisitions with an artificial mutual increase in shareholder value; purchase of expensive assets on credit; creation of fictitious profits with the help of offshore companies; options for management in order to raise theirs concernment. It is important that such increase of capitalization is quite predictable. Organizers know the result of each step in advance, which allows them to receive maximum financial profit from such a process.

So, financial assets are necessary in themselves. However their use in the modern financial markets in the absence of tight restrictions may be harmful. The desire of stock gamblers to maximize profit leads to sad consequences.

Financial assets can be a remedy, and can be a poison. Paracelsus claims in XVI century: "*All substances are poisons; there is none which is not a poison. The right dose differentiates a poison and a remedy*". The issue of financial assets can be imagined as a life-giving source that feeds the needs of a growing economy. Then its action is like a medicine. A small surplus of emission will slightly wash the stream; this is an analog of the effect of inflation in the economy. However if the source significantly increases its debit, the stream will come out of the shores and its action will become destructive.

Rejection of restrictions to liberal market mechanisms of issue and trade in financial assets is the same as refusing to regulate the turnover of narcotic substances. Taking a drug is sometimes useful as an anesthetic; at first it can even cause euphoria. However then there will be an addiction. And a depression is inevitable in the end.

If, as Adam Smith noted, a competitive market for goods and services works as a useful to society "invisible hand", ensuring an optimal distribution of resources and products, then we can compare the action of modern developed stock markets with another invisible destructive hand. This new invisible hand deforms the distribution of total income in favor of wealthy capitalists for the sake of their exaggerated desire for enrichment, and leads the real economy to a dead end.

If to liken the economy to a living organism, then the financial sector performs the hematopoietic and blood circulation functions in this organism. If the circulatory system fulfills its role as it should, delivering the necessary substances to the right place at the right time, then it can be ignored when considering processes of metabolism and growth of the body.

Unfortunately, the functioning of the financial sector often is far from ideal. As the disease of the circulatory system is a cause of disruption of the whole body, similarly the violations in the activity of the financial sector cause damage to the entire economy. Such violations can be a consequence of the modern financial markets work; we analyze this issue in the present study. We believe that the financial sector of the economy is ill, if the aggregate national wealth (the financial side of the capital) does not equal (usually exceeds) the total value of nonfinancial

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[39] "Issuing the bond, the enterprise undertakes to return the money within a certain period; issuing a share, it will never return the money received" (the joke of our teacher on investment management).

assets. This occurs if the value of financial assets does not match the value of the corresponding obligations.

Diseases of the financial sector are periodically exacerbated, and then the crisis comes. Unfortunately, it turns out that the crisis itself cannot cure the economy. After the last global financial crisis of 2007–2008 had passed, it can be stated that the painful symptoms did not disappear. The capitalists in the post-crisis period are still successfully implementing their desire to get more profit. The relatively high return on industrial capital in the real sector of the US economy in 2000th did not actually decrease after 2008 (see curve Δ in Fig. 7). Profit in the financial sector is growing even faster than in real, it resumed the trend of advanced (relative to GDP) growth after the crisis (curve (+) in Fig. 6). Accelerated growth of the financial profit is provided also by the rapid growth in the volume of financial assets (curve ▲ in Fig. 6). The modern stock market works in such a way, that part of the increase in the value of financial assets is not provided by the increase in the value of the corresponding obligations. Such an unsecured increase in assets' value generates unsecured financial gains and unsecured wealth. In particular, a lot of unsecured wealth was formed due to the growth of the unsecured part of the value of other (miscellaneous) financial assets. The graphs shown in Figure 5 indicate the growth of such unsecured value after the crisis.[40]

The inevitable consequence of the existence of unsecured wealth is the increase in wealth inequality, including the redistribution of wealth from poor households to wealthy capitalists, up to the bankruptcy of the poor ones. The fact that such a trend really exists is evidenced by the dynamics of the value of net lending of not the richest households, which, after the crisis, again turned into the area of negative values (solid line in Figure 4). Rising inequality prevents adequate growth in the aggregate demand. Everything is not all right either with the aggregate supply: capital investments are being squeezed out of the real sector (see chart with markers (○) in Fig. 7), because the financial sector turns out to be more attractive. Two tendencies reinforce each other, and as a result, the GDP growth rate has not recovered after the crisis (curve ● in Fig.7). We believe that the totality of these mentioned symptoms portends new financial crises; it is confirmed by the events of 2020.

Appendix A. Consolidated balance sheet of national economy

To determine the size of national wealth we will build in this appendix the balance sheet of the entire national economy (a simplified version, without government and outside world), by aggregating and consolidating the balance sheets of all entities (enterprises and households). We will consider banks separately from non-bank enterprises, which we will henceforth call simply "enterprises".

We have somewhat simplified the reality, considering as securities only equities and bonds. This will allow us, without loss of generality, to understand the nature and causes of distortions introduced into the economy by the stock market.

First, let's build a characteristic balance of a one of (non-bank) enterprises.

Balance sheet of separate enterprise

Assets

1. Currency in the cashier's office of the enterprise (banknotes and coins)
2. Deposits of the enterprise at commercial banks (cash in current and saving accounts)
3. The enterprise's receivables (claims to other enterprises)
4. The enterprise's receivables (claims to households)
5. Debt securities (bonds, promissory note, etc) owned by the enterprise
6. Equities, partner shares and other property rights owned by the enterprise

[40] The increase in the unsecured value of US alternative financial assets (0.55 GDP for 30 years from 1986 to 2016) corresponds to the average annual size of unsecured financial profit of about 2% of GDP; this value is commensurate with the value of financial profit in Figure 5.

7. Nonfinancial assets (inventories, fixed assets) owned by the enterprise

Liabilities

1. The enterprise's accounts payable (claims from households: wages)
2. The enterprise's accounts payable (claims from other enterprises)
3. The enterprise's debts to banks for loans
4. Debt on bonds, promissory notes issued by the enterprise

Equity

1. The enterprise's own capital (equity)

Immediately mention that here and further we will assume that accounting is conducted in good faith, with the observance of the principles of caution and prudence. This means that it is not allowed to overstate the value of assets in the balance sheet, in order to embellish reality and to show the entity in a favorable light. All losses and markdowns of assets should be timely reflected, reducing the own capital (equity), which is calculated as the difference between total assets and liabilities.

Now we will write down the aggregated balance sheet of all (non-bank) enterprises, for which we sum up the corresponding items of assets and liabilities for all such enterprises.

Aggregated balance sheet of all (non-bank) enterprises

Assets

1. Currency in the cashier's offices of all enterprises (banknotes and coins)
2. Total deposits of the enterprises at commercial banks (cash in current and saving accounts)
3. Total enterprises' receivables (claims to other nonfinancial companies)
4. Total enterprises' receivables (claims to households)
5. Debt securities (bonds, promissory note, etc) owned by all enterprises
6. Equities, partner shares and other property rights owned by all enterprises
7. Nonfinancial assets (inventories, fixed assets) owned by all enterprises

Liabilities

1. Total enterprises' accounts payable (claims from households: wages)
2. Total enterprises' accounts payable (claims from other enterprises)
3. Total enterprises' debts to banks for loans
4. Total debt on bonds, promissory notes issued by the enterprises

Equity

1. Total own capital (equity) of all enterprises

The above balance can be viewed as the balance of one huge consolidated company. Individual enterprises are, as it were, separate subdivisions or shops of this company. From this point of view, positions "Total enterprises' receivables (claims to other enterprises)" (item 3 in the assets) and "Total enterprises' accounts payable (claims from other enterprises)" (item 2 in the liabilities) are the inter-company debt between various divisions of the integrated company. Obviously, the amounts of these payables and receivables are equal. Let us consolidate the resulting balance sheet by eliminating these inter-company debts to ourselves in the assets and liabilities.

Consolidated balance sheet of all (non-bank) enterprises

Assets

1. Currency in the cashier's offices of all enterprises (banknotes and coins)
2. Total deposits of the enterprises at commercial banks (cash in current and saving accounts)
3. Total enterprises' receivables (claims to households)
4. Debt securities (bonds, promissory note, etc) owned by all enterprises
5. Equities, partner shares and other property rights owned by all enterprises
6. Nonfinancial assets (inventories, fixed assets) owned by all enterprises

Liabilities

1. Total enterprises' accounts payable (claims from households: wages)
2. Total enterprises' debts to banks for loans
3. Total debt on bonds, promissory notes issued by enterprises

Equity

1. Total own capital (equity) of all enterprises

Our aggregated company is "virtual firm"; it operates only in the moment of drawing up the consolidated balance sheet. In fact, individual entities-enterprises operate independently, and they are not the subdivisions. Therefore, we eliminate (turn-off) only inter-company receivables and payables when consolidating; but the internal profit does not eliminated. Thus, the goods in the balance sheet are reflected at the cost of acquisition, with the seller's profit, even if these goods were shipped from one enterprise to another, that is, inside a virtual consolidated company. Of course, the elimination of internal debts in the consolidated balance sheet means the loss of information about the financial condition of individual entities. In addition, acting in this way, we deliberately simplify the situation, ignoring the possible existence of bad debts. Indeed, some of the entities may not pay off their debts. There may be different reasons for this. For example, bad faith of the borrower, who has deliberately used fraudulent schemes. As a result, if this plan succeeds, the aggregate wealth will be redistributed from the creditor to the debtor-swindler. On the other hand, a honest debtor can also go bankrupt, because of unforeseen losses for example, and will not be able to repay the debt. In this case there also will be a redistribution of wealth; the losses of the debtor-bankrupt will be transformed into losses of the lender due to write-off of the receivables. However the information on the distribution and redistribution of wealth among individual entities is not essential for our analysis of total wealth.
Let us construct similar balance sheets for households existing in our national economy now. Households, unlike enterprises, do not have responsibility to compile accounting reports (balance sheets). However households do something similar when they self-assess their wealth. To do this, you need to calculate the total value of assets owned by the household and the total amount of accounts payable; the wealth is equal to the difference between them, in accordance with the accounting equation. Having this information, it is not difficult to compose the balance of an individual household, similar to the balance sheet of an enterprise. The asset side of the balance sheet will include all the assets owned by the household, and the liabilities on the financing side - all accounts payable. It is necessary to add the household's wealth (equity) on the financing side for balancing. Then the total assets should be equal total financing automatically.

Balance sheet of separate household

Assets

1. Banknotes and coins held by the household
2. Deposits at commercial banks owned by the household (cash in current and saving accounts)
3. The household's receivables (claims to other households)
4. The household's receivables (claims to enterprises and banks: wages)
5. Debt securities (bonds, promissory note, etc) owned by the household
6. Equities, partner shares and other property rights owned by the household
7. Nonfinancial assets (inventories, fixed assets) owned by the household

Liabilities

1. The household's accounts payable (claims from other households)
2. The household's accounts payable (claims from enterprises)
3. The household's debts to banks for loans

Equity

1. The own capital (wealth) of the household

Let us construct the aggregated balance sheet of all households by combining their individual balances.

Aggregated balance sheet of all households

Assets

1. Banknotes and coins held by all households
2. Deposits at commercial banks owned by all households (cash in current and saving accounts)
3. Total households' receivables (claims to other households)
4. Total households' receivables (claims to enterprises and banks: wages)
5. Debt securities (bonds, promissory note, etc) owned by all households
6. Equities, partner shares and other property rights owned by all households
7. Nonfinancial assets (inventories, fixed assets) owned by all households

Liabilities

1. Total households' accounts payable (claims from other households)
2. Total households' accounts payable (claims from enterprises)
3. Total households' debts to banks for loans

Equity

1. Total own capital (wealth) of all households

The resulting aggregated balance sheet of all households can be represented as the balance sheet of one large nationwide family. When considering the general welfare of the family, it is not significant that the younger brother borrowed from the older sister, regardless of whether he will repay the debt, or not. Similarly, the debts between individual households to each other are not significant when calculating the aggregated own capital. There are the debts to oneself, similar to the internal debt of nonfinancial enterprises discussed above. Naturally, such a debt is reflected by the same amounts in the assets and liabilities of the aggregated balance sheet. This is item 3 in the assets "Total households' receivables (claims to other households)" and item 1 in the liabilities "Total households' accounts payable (claims from other households)" at the balance sheet. Let us eliminate these internal payables and receivables and construct the consolidated balance sheet.

Consolidated balance sheet of all households

Assets

1. Banknotes and coins held by all households
2. Deposits at commercial banks owned by all households (cash in current and saving accounts)
3. Total households' receivables (claims to enterprises and banks: wages)
4. Debt securities (bonds, promissory note, etc) owned by all households
5. Equities, partner shares and other property rights owned by all households
6. Nonfinancial assets (inventories, fixed assets) owned by all households

Liabilities

1. Total households' accounts payable (claims from enterprises)
2. Total households' debts to banks for loans

Equity

1. Total own capital (wealth) of all households

Let us construct balances for the banking system (commercial banks plus central bank).

Balance sheet of the central bank

Assets

1. Central bank loans receivable to commercial banks (assets of the central bank)
2. Debt securities (bonds, promissory note, etc) owned by the central bank
3. Equities, partner shares and other property rights owned by the central bank
4. Nonfinancial assets (inventories, fixed assets) owned by the central bank

Liabilities

1. Central bank payables to households on wages
2. Commercial banks' deposits at the central bank (liabilities of the central bank)
3. Currency (banknotes and coins) issued by the central bank (liabilities of the central bank)

Equity

1. The own capital of the central bank

Let us consider commercial banks now. We will omit the balance sheets of an individual bank and of all banks; these stages are similar to what we did for enterprises and households. Let's at once construct the consolidated balance sheet of all commercial banks, in which the internal debts will be eliminated. The equivalent amounts of receivables and payables on interbank loans and other internal debts between commercial banks (debts to oneself) will be excluded in this balance sheet.

Consolidated balance sheet of all commercial banks

Assets

1. Total deposits of the commercial banks at the central bank (asset of the banks)
2. Total currency (banknotes and coins) held in the commercial banks' vaults (asset of the banks)
3. Total amount of loans receivable issued by the commercial banks to customers
4. Debt securities (bonds, promissory note, etc) owned by the commercial banks
5. Equities, partner shares and other property rights owned by the commercial banks
6. Nonfinancial assets (inventories, fixed assets) owned by the commercial banks

Liabilities

1. Total deposits of customers at the commercial banks (liability of the banks)
2. Total amount of the commercial banks' payables to households on wages
3. Total debt payable of the commercial banks on loans received from the central bank
4. Total debt on bonds, promissory notes issued by the commercial banks

Equity

1. Total own capital of the commercial banks

Now let us construct an aggregated balance sheet of the entire banking system, by integrating the balance sheets of the central bank and all commercial banks. In this balance sheet we immediately aggregated homogeneous items from the balance sheets of the central bank and commercial banks (see below items 5-7 in the assets; item 6 in the liabilities and item 1 in equity).

Aggregated balance sheet of the banking system

Assets

1. Central bank loans receivable to commercial banks (assets of the central bank)
2. Total deposits of commercial banks at the central bank (assets of the commercial banks)
3. Total currency (banknotes and coins) held in the commercial banks' vaults (assets of the commercial banks)
4. Total amount of loans receivable issued by the commercial banks to customers (assets of the commercial banks)
5. Debt securities (bonds, promissory note, etc.) owned by the central bank and commercial banks
6. Equities, partner shares and other property rights owned by the central bank and commercial banks
7. Nonfinancial assets (inventories, fixed assets) owned by the central bank and commercial banks

Liabilities

1. Total debt payable of the commercial banks on loans received from the central bank
2. Commercial banks' deposits at the central bank (liabilities of the central bank)
3. Currency (banknotes and coins) issued by the central bank (liabilities of the central bank)

4. Total deposits of customers at the commercial banks (liabilities of the commercial banks)
5. Total debt on bonds, promissory notes issued by the commercial banks
6. Total amount of the central bank and commercial banks payables to households on wages

Equity

1. Total own capital of the central bank and commercial banks

It can be seen that item 1 in the assets "Central bank loans receivable to commercial banks (assets of the central bank)" and item 1 in the liabilities "Total debt payable of the commercial banks on loans received from the central bank" reflect internal indebtedness for the whole banking system. It is a debt to oneself and it should not be taken into account in the consolidated balance sheet; eliminating these values we get:

Consolidated balance sheet of the banking system

Assets

1. Total deposits of commercial banks at the central bank (assets of the commercial banks)
2. Total currency (banknotes and coins) held in the commercial banks' vaults (assets of the commercial banks)
3. Total amount of loans receivable issued by the commercial banks to customers (assets of the commercial banks)
4. Debt securities (bonds, promissory note, etc.) owned by the central bank and commercial banks
5. Equities, partner shares and other property rights owned by the central bank and commercial banks
6. Nonfinancial assets (inventories, fixed assets) owned by the central bank and commercial banks

Liabilities

1. Commercial banks' deposits at the central bank (liabilities of the central bank)
2. Currency (banknotes and coins) issued by the central bank (liabilities of the central bank)
3. Total deposits of customers at the commercial banks (liabilities of the commercial banks)
4. Total debt on bonds, promissory notes issued by the commercial banks
5. Total amount of the central bank and commercial banks payables to households on wages

Equity

1. Total own capital of the central bank and commercial banks

Let's build an aggregated balance sheet of the entire economy by integrating the balance sheets of all its entities (enterprises, households and banking system):

Aggregated balance sheet of the entire national economy

Assets

1. Banknotes and coins held by all households
2. Deposits at commercial banks owned by all households (cash in current and saving accounts)
3. Total households' receivables (claims to enterprises and banks: wages)
4. Debt securities (bonds, promissory note, etc) owned by all households
5. Equities, partner shares and other property rights owned by all households
6. Nonfinancial assets (inventories, fixed assets) owned by all households
7. Currency in the cashier's offices of all enterprises (banknotes and coins)
8. Total deposits of the enterprises at commercial banks (cash in current and saving accounts)
9. Total enterprises' receivables (claims to households)
10. Debt securities (bonds, promissory note, etc) owned by all enterprises
11. Equities, partner shares and other property rights owned by all enterprises
12. Nonfinancial assets (inventories, fixed assets) owned by all enterprises
13. Total deposits of commercial banks at the central bank (assets of the commercial banks)

14. Total currency (banknotes and coins) held in the commercial banks' vaults (assets of the commercial banks)
15. Total amount of loans receivable issued by the commercial banks to customers (assets of the commercial banks)
16. Debt securities (bonds, promissory note, etc.) owned by the central bank and commercial banks
17. Equities, partner shares and other property rights owned by the central bank and commercial banks
18. Nonfinancial assets (inventories, fixed assets) owned by the central bank and commercial banks

Liabilities

1. Total households' accounts payable (claims from enterprises)
2. Total households' debts to banks for loans
3. Total enterprises' accounts payable (claims from households: wages)
4. Total enterprises' debts to banks for loans
5. Total debt on bonds, promissory notes issued by enterprises
6. Commercial banks' deposits at the central bank (liabilities of the central bank)
7. Currency (banknotes and coins) issued by the central bank (liabilities of the central bank)
8. Total deposits of customers at the commercial banks (liabilities of the commercial banks)
9. Total debt on bonds, promissory notes issued by the commercial banks
10. Total amount of the central bank and commercial banks payables to households on wages

Equity

1. Total own capital (wealth) of all households
2. Total own capital (equity) of all enterprises
3. Total own capital of the central bank and commercial banks

Let us integrate homogeneous items in the aggregated balance sheet:
Assets items: 1+7+14; 2+8; 4+10+16; 5+11+17; 6+12+18.
Liabilities items: 2+4; 3+10; 5+9. Equity: 2+3.
In addition, one inaccuracy on the financing side of the above aggregated balance sheet of the national economy should be eliminated. Summing up both the own capital of the business and the own capital of households in the "Equity" section of the balance sheet, we artificially overestimate the national wealth (the own capital of the national economy). The own capital of the business is taken into equity account twice; its value is already a part of the wealth of households whose assets include business' property rights. Therefore, only the own capital of the ultimate owners (households in our case) should be taken into account as a national wealth. Wherein the own capital of a business should be considered as part of the "Liabilities" section in the aggregated balance sheet of the national economy.
After the cuts, obtain:

Aggregated balance sheet of the national economy (shortcut)

Assets

1. Total currency (banknotes and coins) held by the households, enterprises and commercial banks' vaults (items 1+7+14)
2. Total deposits of the households and enterprises at commercial banks (cash in current and saving accounts, items 2+8)
3. Total households' receivables (claims to enterprises and banks: wages, item 3)
4. Total enterprises receivables (claims to households, item 9)
5. Total deposits of commercial banks at the central bank (assets of commercial banks, item 13)
6. Total amount of loans receivable issued by commercial banks to customers (item 15)
7. Debt securities (bonds, promissory note, etc.) owned by all entities (the households, enterprises, banks; items 4+10+16)

8. Equities, partner shares and other property rights owned by all entities (items 5+11+17)
9. Nonfinancial assets (inventories, fixed assets) owned by all entities (items 6+12+18)

Liabilities

1. Total households' accounts payable (claims from enterprises, item 1)
2. Total households' and nonfinancial enterprises debts to banks for loans (item 2+4)
3. Currency (banknotes and coins) issued by the central bank (liabilities of central bank, item 7)
4. Total amount of all enterprises' and banks' payables to households on wages (items 3+10)
5. Total deposits of customers at commercial banks (liabilities of commercial banks, item 8)
6. Commercial banks' deposits at the central bank (liabilities of central bank, item 6)
7. Total debt on bonds, promissory notes issued by the enterprises and commercial banks (items 5+9)
8. Total own capital of all enterprises and banks (items 2+3 in Equity)

Equity

1. Total own capital (wealth) of all households

Let's identify the "inter-company" receivables and payables in the consolidated balance sheet.
This is, firstly, the debt of enterprises and banks to households on wages (item 3 in the assets "Total households' receivables (claims to enterprises and banks: wages)" and item 4 in the liabilities "Total amount of all enterprises' and banks' payables to households on wages").
Secondly, it is household payables to enterprises (item 4 in the assets "Total enterprises' receivables (claims to households)" and item 1 in the liabilities "Total households' accounts payable (claims from enterprises)").
Thirdly, it is the debt of households and enterprises to commercial banks for loans (item 6 in the assets "Total amount of loans receivable issued by commercial banks to customers" and item 2 in the liabilities "Total households' and enterprises' debts to banks for loans").
Eliminating these items from the both sides of the aggregated balance sheet, we get:

Aggregated balance sheet of the national economy; internal payables and receivables are partly eliminated

Assets

1. Total currency (banknotes and coins) held by the households, enterprises and commercial banks
2. Total deposits of the households and enterprises at commercial banks (cash in current and saving accounts)
3. Total deposits of commercial banks at the central bank (assets of commercial banks)
4. Debt securities (bonds, promissory note, etc.) owned by all entities (the households, enterprises, banks)
5. Equities, partner shares and other property rights owned by all entities
6. Nonfinancial assets (inventories, fixed assets) owned by all entities

Liabilities

1. Currency (banknotes and coins) issued by the central bank (liabilities of central bank)
2. Total deposits of customers at commercial banks (liabilities of commercial banks)
3. Commercial banks' deposits at the central bank (liabilities of central bank)
4. Total debt on bonds, promissory notes issued by the enterprises and commercial banks
5. Total own capital of all enterprises and banks

Equity

1. The wealth (total equity of all households)

Further simplifications will be related to the money and to their issue; we will make some preliminary explanations on this issue. By money we mean fiat money - it is a financial asset that has unlimited circulation in the economy and is mandatory for admission. More on the nature of

money in the historical perspective is discussed in Section 8. Like any financial asset, money has an issuer (a bank) that has corresponding liabilities, similar to how the issuer is liable for the issued promissory note. The issuer of banknotes and coins is the central bank; the liabilities in connection with this issue are reflected in item 1 of the "Liabilities" section: "Currency (banknotes and coins) issued by the central bank (liabilities of central bank)". The amount of these obligations is equal to the value of the issued currency, which is reflected in item 1 of the assets: "Total currency (banknotes and coins) held by the households, enterprises and commercial banks". Of course, currency is necessary for the normal functioning of the economy, it has important functions. However these multi-colored pieces of paper, sliced by an authorized body for use within the national economy, do not affect the nation's wealth. The distribution of money between entities affects their shares in the aggregate wealth, but not affects the total amount of the wealth. Therefore, it is advisable to eliminate the respective items in the assets and liabilities in the aggregated balance sheet of the national economy.

As for electronic money, its issuer is also a banking system: central and commercial banks. Such money is emitted, as a rule, at the moment of issuing a loan (see example, Table 4 in Section 8), and with further circulation they lose contact with the initial issuer. Then the corresponding liability for such a financial asset as electronic money is borne by the bank, in which they are deposited on. We can identify two pairs of financial assets and corresponding liabilities in the consolidated balance sheet, which are connected with the electronic money issue. Firstly, these are items related to the issue of money by the central bank when lending to commercial banks: item 3 in the assets "Total deposits of commercial banks at the central bank (assets of commercial banks)" and item 3 in the liabilities "Commercial banks' deposits at the central bank (liabilities of central bank)". Secondly, these are items related to the issue of money by commercial banks when lending to their customers: item 2 in the assets "Total deposits of the households and enterprises at commercial banks (cash in current and saving accounts)" and item 2 in the liabilities "Total deposits of customers at commercial banks (liabilities of commercial banks)". Electronic money does not affect the aggregate wealth of society, as well as banknotes and coins. Therefore, it is inappropriate to take them into account in our analysis and the corresponding items in the assets and liabilities of the balance sheet can be eliminated; their values are equal to each other.

As a result, consolidated balance sheet can be rewritten definitively:

Consolidated balance sheet of the national economy

Assets

1. Total amount of debt securities (bonds, promissory note, etc.) owned by all entities (the households, nonfinancial enterprises, central bank and commercial banks)
2. Total amount of equities, partner shares and other property rights owned by all entities
3. Total amount of nonfinancial assets owned by all entities

Liabilities

1. Total debt on debt securities (bonds, promissory notes) issued by enterprises
2. Total own capital of all business entities (enterprises and banks)

Equity

1. The wealth (total equity of all households)

Items 1 and 2 on the assets side of the resulting consolidated balance sheet reflect the value of financial assets. The values of the financial assets are secured by their issuers; the corresponding obligations are reflected on the financing side of the balance sheet of these issuers (item 1 and 2 in the liabilities). At the time of occurrence, the value of the financial asset is automatically equal to the value of the corresponding obligations in the issuer's balance sheet, which corresponds to the cost (asset-based) approach, described in Section 3. If this method of evaluation would be relevant further, then the indicated items (1 and 2 in the assets; 1 and 2 in the liabilities) would always be equal to each other respectively. In this case, by virtue of the accounting identity (total

assets must be equal the sum of liabilities and equity), item 3 in the assets and item 1 in the Equity section should be equal to each other. This would correspond to the classical approach: national wealth which is equal to the own capital of households (in the absence of the state and the outside world), is equal to the total value of nonfinancial assets.
However those financial assets that are securities imply free market circulation and pricing. In this case their value is determined on the financial market by the income approach rather than the cost approach. Therefore, the deviations of the value of the financial assets from their corresponding obligations are possible. If such deviations will take place, then the national wealth should differ from the total value of nonfinancial assets.

Appendix B. Consequences of mergers and acquisitions (M & A). Entangled ownership structure

Financial assets are widely used in the modern world as a tool to maximize profits. The effectiveness of such an instrument is largely ensured by the volatility of financial assets' prices. Shares and some other financial assets have such a property and therefore the securities traders are actively using them nowadays. The analysis carried out in Sections 5-6 indicates that the volatility of prices of financial assets is often associated with a deviation of the value of these assets from the value of the corresponding obligations in the balance sheet of the issuer. The positive difference between the values of financial assets and the corresponding obligations means the excess and unsecured wealth, and testifies about a violation in nominal terms of the law of conservation of wealth formulated by us here. The large amount of such a difference indicates the overheating of the financial market and the increased risks, cooling the ardor of financial speculators. The difference between the value of financial assets and their corresponding obligations can easily be identified: the criterion for stocks is Tobin's q-factor (see Figure 1); such difference for miscellaneous financial assets is shown in Fig.5. That is, the degree of overheating of the financial market is easy to detect, which automatically should limit the potential amplitude of price fluctuations for attractive financial instruments.
It turns out that the above-described limit can be overcome for stocks. This appendix demonstrates a mechanism based on an entangled ownership structure, allowing arbitrarily increase the shareholder value (and, likewise, the value of investment funds). Its growth can be unjustified in fact, while the shares overvaluation is imperceptible, since the difference between the shareholder value and the own capital of corporation-issuer may not arise. It means, that the law of conservation of wealth is observed in nominal terms. The shares do not look overvalued, which makes it possible to generate unsecured wealth imperceptibly in increased volumes. Financial traders have received the instrument for redistribution of aggregate wealth and income by obtaining additional unsecured financial gains. Such unsecured gains are not related to the real sector of economy and to the value added created there. So, the additional real income and wealth are not created, while only the available ones are redistributed. Indeed, if someone wins, then someone necessarily loses, because the amount of available goods in the real sector of economy does not change in this case.
The mechanism described here has long been widely used. It works due to the corporations' entangled ownership structure. Under the term "entanglement" we mean an ownership structure of enterprises, where not all these property rights ultimately belong to individuals - households. Part of the property rights is in the cross-ownership of enterprises: first corporation owns shares of the second, and the second - the shares of the first (more complex chains with more enterprises are also possible). In this case, there may be "miracles" when the shareholder value of corporation is clearly overvalued, but this is very difficult to detect mathematically, since formally this value corresponds to the issuer's equity. Creating of the entangled ownership structure is possible through mergers and acquisitions. Such transactions are usually conducted to increase capitalization.
Let's consider the entangled ownership structure using the example of a closed mini-economy the real sector of which is identical to that described in Sections 3 and 5, see Table 2 (which is the

copy of Table 2 in Section 3). The economy includes two enterprises, a bank, a holding company and households.

Table 2 Aggregated balance sheet of the economy (initial)

Entity	Assets		Financing	
	Asset name	Sum	Liability or equity	Sum
Enterprise A	Cash	$2500	Bank loan received	$2500
	Nonfinancial assets	$10000	Enterprise A share capital	$10000
Enterprise B	Nonfinancial assets	$10000	Enterprise B share capital	$10000
Bank	Loans issued	$2500	Deposits	$2500
	Nonfinancial assets	$10000	Bank share capital	$10000
Holding company	Enterprise A shares	$10000	Holding company's share capital	$20000
	Enterprise B shares	$10000		
Households	Holding company's shares	$20000	Own capital (wealth)	$50000
	Bank shares	$10000		
	Nonfinancial assets	$20000		

Let enterprise B to buy a half of the shares of a holding company from households at a market value of $10,000 in order to make the entangled ownership structure. Payment will not be made, then enterprise B will have accounts payable, and households have an accounts receivable for the amount of the transaction. Then the aggregated balance sheet of our mini-economy can be represented as:

Table 2b Aggregated balance of the economy (initial), ownership structure is entangled by 50%

Entity	Assets		Financing	
	Asset name	Sum	Liability or equity	Sum
Enterprise A	Cash	$2500	Bank loan received	$2500
	Nonfinancial assets	$10000	Enterprise A share capital	$10000
Enterprise B	Holding company's shares 50%	$10000	Accounts payable	$10000
	Nonfinancial assets	$10000	Enterprise B share capital	$10000
Bank	Loans issued	$2500	Deposits	$2500
	Nonfinancial assets	$10000	Bank share capital	$0000
Holding	Enterprise A shares	$10000	Holding company's share	$20000

company	Enterprise B shares	$10000	capital	
Households	Accounts receivable	$10000	Own capital (wealth)	$50000
	Holding company's shares 50%	$10000		
	Bank shares	$10000		
	Nonfinancial assets	$20000		

Further, similar to the scenario described in Sections 3 and 5, the enterprises A and B will make a transaction in the real sector of economy for the purchase of goods worth $2500. As a result the enterprise B will receive a profit of $500 (cost of goods sold is $2000). That is, the net worth of corporation B will increase by $500. Information about the profit received and the increase in equity usually increases capitalization (shareholder value) of the corporations. Therefore, the market shareholder value of enterprise B also must go up. We will assume that stock market participants are prudent, and the shareholder value of enterprise B will grow to the equivalent of an increase in its own capital by $500 to $10500. This corresponds to the cost approach of asset valuation described in Section 3.

Of course, the formation of stock prices in the modern stock market does not correspond to the cost approach. Nevertheless, the application of this method here allows us to consider separately the consequences of the entanglement of the ownership structure, excluding the effect associated with the violation in nominal terms of the law of wealth conservation which arises due to shares market pricing; this effect is considered in detail in Sections 4 - 6.

Shares in the balance sheet of their owners are reflected at market value. Therefore, the assets' value in the balance sheet of the holding company had to increase, as the shares' price of enterprise B will grow in the example under consideration. This must be reflected by an increase in the company's own capital, according to the principle of a double entry, also in the amount of $500. The equity of the holding company has grown; therefore, the shareholder value of this company should grow also. It is natural to assume that the shareholder value of the holding company will also grow by $500 to $20,500; such an assumption corresponds to the cost approach used here. Then the value of shares of the holding company will increase in the assets in the balance sheets of their owners: households and enterprise B, by $250 each. Accordingly, their own capital will increase by the same amount. A supplement (revaluation) of $250 will be added to the profit of the enterprise B in $500, which will total $750. Let's try to make an updated aggregated balance sheet in accordance with the above reasoning:

Table 2.1b Aggregated balance sheet of the economy after transaction (intermediate), ownership structure is entangled by 50%

Entity	Assets		Financing	
	Asset name	Sum	Liability or equity	Sum
Enterprise A	Nonfinancial assets	$12500	Bank loan received	$2500
			Enterprise A share capital	$10000
Enterprise B	Cash	$2500	Accounts payable	$10000
	Holding company's shares 50%	$10250	Enterprise B share capital	$10000

	Nonfinancial assets	$80000	Profit/Revaluation	$750
Bank	Loans issued	$2500	Deposits	$2500
	Nonfinancial assets	$10000	Bank share capital	$10000
Holding company	Enterprise A shares	$10000	Holding company's share capital	$20000
	Enterprise B shares	$10500	Profit/Revaluation	$500
Households	Accounts receivable	$10000	Own capital (wealth)	$50250
	Holding company's shares 50%	$10250		
	Bank shares	$10000		
	Nonfinancial assets	$20000		

Assets in the above aggregated balance sheet are equal to the financing for all participants. However, on closer examination, it turns out that this balance sheet is not completely correct. The net worth of enterprise B is $10,750, whereas the market value of its shares is only $10,500. The value of shares of enterprise B turns to be underestimated, which contradicts the cost business valuation methodology adopted by us.

The initial profit of enterprise B ($500) brought to an additional revaluation of the company's own capital by $250 due to the entangled ownership structure. Such additional increase in the equity of enterprise B should lead to an additional increase in the market value of its shares. We believe that this value should additionally increase by the same amount of $250, in accordance with the cost approach used. Further, similarly to the foregoing, an increase in the value of shares of enterprise B will increase the amount of net assets of the holding company. This will increase the company's own capital and hence the market value of its shares. As a result of this iteration, the value of net assets of the holding company shareholders (households and enterprise B) will increase by $125 for each of these two entities.

The additional increase in the own capital of enterprise B of amount $125 is again not compensated for by the increase in the shareholder value of this enterprise. Therefore a new iteration should follow after the previous one, and so on ad infinitum. Fortunately, a number of iterations converge. The total increase in the equity of enterprise B gives in the limit: $250+$125+$62.5+... =$500. Households' own capital (wealth) should increase by the same amount.

Table 2.2b Aggregated balance sheet of the economy after transaction (final), ownership structure is entangled by 50%

Entity	Assets		Financing	
	Asset name	Sum	Liability or equity	Sum
Enterprise A	Nonfinancial assets	$12500	Bank loan received	$2500
			Enterprise A share capital	$10000
Enterprise B	Cash	$2500	Accounts payable	$10000

	Holding company's shares 50%	$10500	Enterprise B share capital	$10000
	Nonfinancial assets	$80000	Profit/Revaluation	$1000
Bank	Loans issued	$2500	Deposits	$2500
	Nonfinancial assets	$10000	Bank share capital	$10000
Holding company	Enterprise A shares	$10000	Holding company's share capital	$20000
	Enterprise B shares	$11000	Profit/Revaluation	$1000
Households	Accounts receivable	$10000	Own capital (wealth)	$50500
	Holding company's shares 50%	$10500		
	Bank shares	$10000		
	Nonfinancial assets	$20000		

The resulting final aggregated balance sheet demonstrates that the law of conservation is not violated in nominal terms. The total increase in wealth (own capital of households) of $500 is equal to the total growth of the value of nonfinancial assets. Exactly the same amount of wealth increase was also observed in Section 3, where the cost method of valuation was used in the absence of an entangled ownership structure, see Tables 1.1 and 2.1. In both cases (in section 3 and here), total financial assets and the corresponding obligations are equal, and the aggregate wealth is equal to the total value of non-financial assets.

However, Table 2.2b demonstrates that the own capital and shareholders' values of enterprise B and of the holding company paradoxically grew up to $1000 instead of intuitively understandable growth of $500 which corresponds to the profits of the enterprise in the real sector of economy. The shareholder values of enterprise B and of the holding company have been increased by 2 times greater than it is objectively due to. Such a growth in capitalization is not secured by the profit in the real sector of the economy. However this growth of share prices dramatically expands opportunities for the redistribution of income and wealth. Surprisingly, this paradoxical rise in stock prices is observed simultaneously with the nominal compliance of the law of conservation of wealth, and when using the cost approach to asset valuation.

Of course, the paradox takes place due to the entangled ownership structure. By virtue of this structure, some of the shares do not fulfill their natural function - evidence of property rights. This is 50% of the shares of a holding company which are owned by enterprise B in the considered example. Ultimately, the total wealth, directly or indirectly, should belong to the households. However these 50% of shares are in cross ownership, they do not belong to households either directly or indirectly. The last statement can be illustrated by considering the process of paying dividends by corporations.

Imagine that companies decided to pay all profits to their owners as dividends. Enterprise B accrues and pays $1000 to its owner - a holding company. Similarly, the holding company will also pay dividends to its owners for the amount of profit /revaluation ($1000), which will be divided into 2 equal parts - for households and for enterprise B. Finally, the balance of the paid/received dividends will be: a holding company - zero ($1000 paid and $1000 received); enterprise B pays of $500 ($1000 paid and $500 received); households receive $500.

Entanglement in this example can be presented as the withdrawal of shares from the turnover. The holding company ultimately belongs to households as well as any other business. While entangling the ownership structure, we transferred half of the holding company shares to enterprise B, and thereby withdrew these shares from the turnover. As a result, ownership of the holding company is ensured by the remaining half of its shares which belongs to the households. It is exactly these 50% that are the "working" part of shares that ensures the right to receive dividends and property rights of the households.

In the example under consideration, the real profit of $500 originally received by enterprise B should ultimately be distributed to the final proprietors-households, and that is really going on. The same result (finally company B pays, and households receive $500) take place for a normal (not entangled) ownership structure, see Table 2.1 in Section 3. However for the case under consideration with an entangled ownership structure, the households' receipt of this profit is provided by 2 times fewer shares of the holding company, compared with the option discussed in Section 3. This means that the value of the return on shares of the holding company should really increase by 2 times.

Indeed, in the "not entangled" version, considered in Section 3, the return on capital invested by households in the business of a holding company is $500/$20,000=2.5%. If the ownership structure becomes entangled, the value of return on capital will increase by 2 times: $500/$10,000 =5%.The latest notice about the growth of the yield of the "entangled" stocks indicates the potential instability of prices for such stocks in the modern economy, where the cost of a business is usually determined by the capitalization of income method. For our example, when the profit of a holding company has doubled, the market price of the shares of this company should also double, in accordance with Equation 3 in Section 4, if expected average return on assets is a constant. This kind of stock price volatility is described in section 4; here we do not focus on this issue, since we evaluate the business using the cost method.

It is easy to see that the degree of ownership structure entanglement can be changed. If more than half of the shares were purchased from households in the given example, then the additional growth of the financial profit and shareholders' value of corporations would be even greater. When buying 100% of holding company's shares from households ("perfect offshore"[41]), there would be instability; such a situation is shown in Table 2c below.

Table 2c Aggregated balance sheet of the economy (initial), ownership structure is entangled by 100% (perfect offshore)

Entity	Assets		Financing	
	Asset name	Sum	Liability or equity	Sum
Enterprise A	Cash	$2500	Bank loan received	$2500
	Nonfinancial assets	$10000	Enterprise A share capital	$10000
Enterprise B	Holding company's shares 100%	$20000	Accounts payable	$20000
	Nonfinancial assets	$10000	Enterprise B share capital	$10000
Bank	Loans issued	$2500	Deposits	$2500

[41] By term "perfect offshore" we mean the corporations' hypothetical owenship stucture, under which ultimate property rights owners and beneficiaries are not known in principle. In the example given, the holding company and enterprise B do not have any individual as final owner - the first enterprise entirely belongs to the second, and the second - to the first.

	Nonfinancial assets	$10000	Bank share capital	$10000
Holding company	Enterprise A shares	$10000	Holding company's share capital	$20000
	Enterprise B shares	$10000		
Households	Accounts receivable	$20000	Own capital (wealth)	$50000
	Bank shares	$10000		
	Nonfinancial assets	$20000		

The above Table 2c shows the initial state of the perfect offshore. The difference from the variant reflected in Table 2b: enterprise B buys from households not 50%, but 100% of the holding company's shares.

The total wealth (own capital of households) in this case is fixed and amounts to $50,000. It does not depend on the financial results of the economic activity in the real economy. This situation contradicts with common sense, but it is formally permissible.

Suppose that enterprise B made a profit in the real sector of the economy. The profit in the real sector means an increase in total value of nonfinancial assets of the society. In this case the violation of the conservation law is inevitable and unrecoverable. The increased aggregate value of nonfinancial assets will surely exceed the value of the aggregate wealth of households, which is fixed. At the same time, the total amount of financial assets should be less than the value of the corresponding obligations, because of the accounting identity between total assets and financing. Shares are undervalued, shareholder value is less than the equity of issuers; this contradicts the logic of their issue and circulation. Stock prices should rise, but this will not eliminate the imbalance between their value and the issuers' own capital. After all, any increase in the price of shares will automatically lead to the same increase in the equity capital of corporations as was described above before. Contradiction cannot be eliminated. The above example of a perfect offshore, where the entanglement is maximized, demonstrates catastrophic instability of stock prices, even if a cost-based method of valuation is used.

The above considerations raise doubts about the safety of the entangled ownership structure as such, as well as safety of merger and acquisition procedures. Such a structure does not contribute to the transparency and sustainability of the economy.

However, the entangled ownership structure is very attractive for financial dealers. It not only provides an opportunity to artificially increase the volatility of stock prices, thereby improving the tools of the stock market. In addition, such ownership structure contributes to the manageability of the stock market. For example, one can stimulate the growth of share prices by intensive redeeming these shares additionally issued or owned by households, and thereby increasing the degree of entanglement of ownership structure, and vice versa. It may be that corporations and founds with an entangled ownership structure will agree with each other, or that they initially have been linked. Then the "market" formation of stock prices is actually quite manageable.

A similar algorithm of entanglement can be applied for investment and mutual funds, as well as for similar structures accumulating financial assets: Fund A owns shares of fund B and vice versa (the chain can be extended and branched out, the essence does not change). In this case the value of the shares of these funds A and B can be simultaneously increased, because formally they are simultaneously both the assets and the obligations for each other.

It turns out that the instruments for redistributing income and wealth due to entanglement of ownership structure have already long been created and used. They are somewhat more complex and sophisticated than the example above, and are usually created by mergers and acquisitions of corporations. For example, if we consider the ownership structure of Microsoft or Amazon, then

in addition to the companies' founders who control 10-15% of the shares, at least 30-40% belongs to the same pool of US financial investment companies and funds, which in turn own each other's shares. The gradual increase in the degree of entanglement of ownership structure is evidenced by the following fact: less than 40% of the total shareholder value in the US is owned by households; in 1945 households owned 95% of all equities.[42]

As a rule, a significant increase in the shareholder value of any blue chip was accompanied by mergers and acquisitions. After maximum growth, there is usually a recession and a "lateral trend", that is oscillations around a slightly varying mean value. Just such dynamics are typical for the process of redistribution of wealth. Against the backdrop of dizzying growth and rush demand, it seems that everyone earns. Then at some point the owners - organizers of this roulette sell part of their shares, fixing profits and initiating a falling trend. The instrument has worked out its life cycle, and then we need a new instrument. The founders and financial structures controlling the process recorded their financial profit when selling shares at the maximum, which means that someone necessarily lost. The redistribution of income and wealth has been occurred.

The paradox of the «perfect offshore», which is demonstrated in this appendix, arises due to unlimited circulation of securities (shares). Corporate mergers and acquisitions make it possible to create an entangled ownership structure that is meaningless in itself, but which allows miraculously multiply the shareholder value. In this case, a part of the shares lose their inherent function initially associated with the distribution of income.

Appendix C A broad interpretation of Harrod-Domar equation

The well-known Harrod-Domar equation (Harrod, 1939; Domar, 1946) has the form:

$$K/Y = s/g \qquad \text{(C.1)}$$

where $s=S/Y$ is usually means the ratio of total net savings S (which is equal to net investment) to GDP (Y); K is total accumulated capital; g is the growth rate of real output.

This equation can have several interpretations. The interpretation relevant for this paper is as follows:

Theorem C1: If the average growth rate g of the aggregate real output and the average investment rate s_j in a certain type j of assets (or even obligations) in units of GDP $s_j \equiv S_j/Y$ are constant, then in the long, run $(gt)>>1$, the ratio of the accumulated stock of the assets under consideration to the GDP K_j/Y will tend to the value determined by the equation:

$$K_j/Y = s_j/g \qquad \text{(C.2)}$$

This statement we call the broad interpretation of the Harrod-Domar equation.

One can calculate the accumulation (in units of GDP) of various quantities by using the last equation. If we consider aggregate nonfinancial capital as an accumulable asset, then s_j should be understood as a share of net capital investment I/Y. If we mean the total wealth (the equity capital of the ultimate owners - households) by the value of K_j, then the aggregate net savings $s_j=S/Y$ of the households act as an "investment" in the accumulated value. You can also calculate the total public debt, and then by s_j you should mean the budget deficit in units of GDP.

Let us prove that equation (C.2) is fulfilled subject to the condition on the constancy of the values of g and s_j.

Let the value of the aggregated output Y grows at a constant rate g for $t > T$:

$$Y(t)=Y_0 exp(g(t-T))$$

[42] Calculation of the households' share of total shareholder value is in Appendix G Data Sources.

where Y_0 is the output level at time T, $Y(T) \equiv Y_0$.
Considering the continuous-time model (different from discrete-time), it is necessary to make a remark about the dimension of the variables. The exponent in the last equation is dimensionless, as it should be, because the dimension of the growth rate g of the aggregate output is inverse of the time, $dim\ g=T^{-1}$. Then, in accordance with Equation (C.2), the dimension of the aggregate output should be equal to "cost divided by time", $dim\ Y=\$T^{-1}$, since the propensity to save s_j is dimensionless, and the dimension of capital is cost, $dim\ K_j=\$$. The dimension of the variable Y may seem surprising, nevertheless, it is quite correct; other variables that characterize the flows of value: consumption, investment, savings, will have the same dimension. While discrete-time consideration, all such variables are taken into account over a given period of time, usually over a year; therefore, it may seem that the growth rate g is dimensionless, and the value of the output Y has the dimension of cost.
Let the share of total output invested in type j of assets be constant ($s_j \equiv S_j(t)/Y(t)=const$), then

$$K_j(t+\Delta t) = K_j(t) + s_j Y(t)\Delta t$$

And when $\Delta t \to 0$:

$$dK_j(t)/dt = s_j Y(t)$$

Applying the change of variables $X(t)=K_j(t)/Y(t)$and differentiating $X(t)$, we obtain (taking into account $dY/dt = gY$):

$$dX/dt = (1/Y)\, dK_j(t)/dt - (K_j/Y^2)\, dY/dt = (1/Y)s_j Y - (K_j/Y^2)\, gY = s_j - gK_j/Y$$

or

$$dX/dt = s_j - gX$$

The solution to the last differential equation is:

$$X = s_j/g + const \times exp\,(-(t-T)\, g)$$

For large values of $(t-T) >> 1/g$, the second term on the right side of the equation is negligible, and the ratio K_j/Y asymptotically tends to

$$K_j/Y = s_j/g \ \blacksquare$$

If inflation takes place at a constant rate, then it is necessary to take into account the additional growth of nominal GDP and the revaluation of accumulated capital:

$$dY/dt = (g+i)Y$$

$$dK_j(t)/dt = s_j Y(t) + i_j K_j(t)$$

where K_j and Y are taken into account at the current nominal value, and i and i_j are, respectively, the inflation rates of the GDP and of the type j asset under consideration.
Similar to the derivation of Equation (C.2), by replacing the variables $X=K_j/Y$, and differentiating, we get:

$$dX/dt = (1/Y)\, dK_j(t)/dt - (K_j/Y^2)\, dY/dt = (1/Y)\{\, s_j Y(t) + i_j K_j(t) - (K_j/Y^2)\,(g+i)Y$$

Simplifying, we have

$dX/dt = s_j – (g+ i – i_j) X$

The solution of this equation is:

$X = s_j/(g+ i – i_j) + const \times exp (– (t –T) \times (g+ i – i_j))$

Thus, taking into account inflation, the ratio K_j/Y over the large period of time $(t – T)>>1/ g$ asymptotically tends to:

$$(K_j /Y)= s_j/\{g+ (i – i_j)\} \quad (C.3)$$

If the inflation rates of output (GDP) and capital of the corresponding type are equal, ($i_j = i$), then Equation (C.3) will degenerate into Equation (C.2), where Y and K_j are measured at current value.

Practical use in Section 8 the results obtained:
Fiat money
If we consider the total emitted amount of money in the economy of K_{emit} (checkable deposits and currency for the US) as an object of accumulation, then Equation (C.2) can be rewritten:

$$K_{emit} /Y= s_{emit}/g \quad (C.4)$$

And if actually observed amount of cash (in units of GDP) is known, $K_{emit} /Y=0.2$, then for $g = 0.03$ one can calculate the required value of annual emission s_{emit} (also in units of GDP):

$$s_{emit}= g\ K_{emit} /Y=0.006=0.6\% \quad (C.5)$$

Rejection of the gold standard
For the case including inflation, Equation (C.3) can be rewritten; financial assets (money in this case) are not revalued due to inflation, i_j=0:

$$K_{emit} /Y= s_{emit} /(g+i) \quad (C.6)$$

And if GDP inflation is $i = 0.03$, and all other things being equal, the annual issue of money in terms of GDP will be:

$$s_{emit}= (g+i)\ K_{emit} /Y=0.012=1.2\% \quad (C.7)$$

Appendix D Rising in wealth inequality amid population growth
Equations 24 and 25 were analytically obtained in section 7 for the amount of wealth accumulated by an individual household in the case of a constant population and labor resources. We solve the similar exercise in this appendix for a more complex model with a growing at a constant rate n population.
Similarly to Section 7, let us make the change of variables $X=K_{fi}(t)L(t)/Y(t)$ and differentiate the value of X with respect to time. Taking into account the obvious relations $dY/dt=gY$, $dL/dt=nL$, and equation (22) $dK_{fi}/dt=s_i[rK_{fi}+w_i]$, we have:

$dX/dt=(L(t)/Y(t))dK_{fi}(t)/dt+(K_{fi}(t)/Y(t))dL(t)/dt – (K_{fi}(t)\ L(t)/Y(t)^2)\ dY(t)/dt =$
$=[rs_i\ K_{fi}(t)+s_i w_i(t)]\ L(t)/Y(t) + n\ L(t)\ K_{fi}(t)\ /Y(t)– gY(t)K_{fi}(t)\ L(t)/Y(t)^2=$

$= s_i w_i(t)L(t)/Y(t)+[rs_i+n-g]X(t)$, or

$$dX/dt=s_i w_i(t)L(t)/Y(t)+[rs_i+n-g]X(t), \quad \text{(D.1)}$$

We assume for simplicity, that economic growth is balanced for individual households, so that all wages $w_i(t)$ grow at the same rate, which is equal to the growth rate of labor productivity Y/L In this case the value $s_i w_i(t)L(t)/Y(t)$ is constant in time (we also assume that all individual propensities for saving s_i are constant). Then equation (D.1) has an analytical solution (which is an analog of equation 24 in Section 7):

$$X=K_{fi}(t)L(t)/Y(t)=s_i w_i(t)L(t)/[Y(t)(g-n-rs_i)]+const_3 \times exp\,(-t\times(g-n-rs_i)) \quad \text{(D.2)}$$

The constant in the last equation can be calculated based on the initial conditions

$$const_3=[K_{fi}(0)(g-n-rs_i)-s_i w_i(0)]L(0)/[Y(0)(g-n-rs_i)] \quad \text{(D.3)}$$

The first term on the right side of equation (D.2) provides a mechanism for the accumulation of capital at the expense of labor income, the second term - at the expense of capital income. If $rs_i<g-n$, then the second term asymptotically tends to zero when $t>>1/(g-n-rs_i)$, then the quantity X tends to a constant value:

$$X=K_{fi}(t)L(t)/Y(t) = s_i w_i(t)L(t)/[Y(t)\,(g-n-rs_i)]=const$$

$$K_{fi}(t)/Y(t) = s_i w_i(t)/[Y(t)\,(g-n-rs_i)]=const/\,L(t) \quad \text{(D.4)}$$

The last formula is an analog of equation (25). It follows that the level of wealth inequality is limited and proportional to the ratio of labor income, taking into account the propensity to save, which was discussed above in Section 7.

If the condition below holds for at least one *i*-th household,

$$rs_i>g-n \quad \text{(D.5)}$$

then the second term on the right-hand side of equation (D.2) grows exponentially. This means that if one or more (wealthy) households saves so much that inequality (D.5) is true for them, then their wealth will grow at a faster pace relative to the fortunes of other, not the richest, households.

The growth dynamics of wealth inequality in the considered model with a constant population growth does not fundamentally differ from the corresponding dynamics in the case discussed in Section 7 (with a constant population). The condition determining the nature of this dynamics ("labor" or "capital") is the inequality (D.5), slightly different from the refined Picketty inequality (21). Inequality (D.5) is weaker than inequality (21). To analyze the differences, we consider a specific intermediate case when inequality (D.5) is already satisfied and inequality (21) has not yet been fulfilled for the richest households:

$$g>rs_i>g-n \quad \text{(D.6)}$$

In this case the largest fortunes grow faster than the fortunes of the rest of the households, and the wealth inequality rise. On the other hand, the largest fortunes are still growing slower than GDP.

It is important for us to find out whether in this case the total capital of wealthy households grows faster than GDP, dooming the poor to direct impoverishment in the archaic economy, and to impoverishment by accumulating unsecured wealth in the modern economy. For two separate households (rich and poor), the gap in wealth is widening, but it is not known whether the

inequality in relation to the corresponding groups (rich vs. poor) is increasing, since this depends on the dynamics of the number of participants in these groups. It is unclear whether the number of households in the rich group is growing, and if so, at what rate; do the propensities for savings among members of this group grow as their income rises.

It seems to us that the intermediate state corresponding to inequality (D.6) is unstable, and in the long run the increase in inequality between rich and poor and the impoverishment of the latter will inevitably accelerate. Firstly, a group of lucky people rapidly growing their wealth can increase their numbers with population growth. Some households with "labor" savings can get into this group, increasing their propensity for saving (most likely due to a sharp increase in either labor or capital income and from successful speculation). If the group of the lucky ones grows at the same rate as the population, then their combined wealth will grow at the rate of rs_i+n, i.e. faster than GDP. Moreover, the rich increase their income at a faster pace, and are unlikely to increase consumption at the same pace. This means that their propensity to save s_i will grow, and after some time, inequality (21) for such households will be fulfilled.

As a result, we conclude the following:

Amid population growth at a constant pace n, the outstripping growth of the largest fortunes starts "earlier", that is, with lower propensities to save (inequality D.5 instead of inequality 21). But the intermediate situation for households whose values of s_i are in the range $g/r > s_i > (g–n)\ r$ is unlikely to last long, most likely there will be a transition to the “labor” concept of capital accumulation (growing at a wage growth rate), or to the "capital" concept (with an outstripping GDP growth rate when inequality 21 is fulfilled).

Appendix E Numerical simulation of the rising inequality dynamics

E1. Introduction. The initial state of the economy

The purpose of this appendix is to analyze the dynamics of increasing inequality in a growing two-sector (household and business) economy when the law of conservation of wealth is broken in nominal terms, and the excess and unsecured wealth is formed.

The appendix presents a model in which the values of income, consumption, and wealth are calculated recursively for 100 individual households over 20 time periods ($1 \le t \le 20$). We believe that an equilibrium balanced growth at a constant pace g has been observed in the economy over a long period of time preceding the periods under consideration ($t \le 0$); unsecured wealth is absent during this previous period, $K_f(t)=K_n(t)$. For some reason the net worth of the 10 richest households immediately and unreasonably increased at the moment $t=+0$, so that the aggregate wealth have been exceeded the total nonfinancial capital, $K_f(t=+0)>K_n(t=+0)$. This can happen, for example, due to an unsecured jump in the value of financial assets owned by wealthy households.

Let us understand how the unsecured wealth may arise initially. Unsecured income is a required companion to the emergence and further growth of such wealth. Unsecured income, in accordance with Equation (15) ($\Delta H=r_fK_f-r_nK_n$), can arise: (a) due to the difference between the aggregate wealth K_f and total nonfinancial capital K_n, and (b) due to the difference in returns on assets in the financial and real sector r_f and r_n. If the capital market turns out to be perfect, $r_f=r_n$, simultaneously with the equality of total nonfinancial capital and wealth, $K_n=K_f$, then $\Delta H=0$, that is, the emergence of unsecured capital is impossible. Thus, at least a short-term violation of the capital market perfection ($r_f>r_n$) is necessary for the initial appearance of unsecured wealth.

The difference between the magnitudes of profitability ($r_f>r_n$) is no longer necessary for the growth of unsecured wealth after the emergence of the latter ($K_f>K_n$); the unsecured wealth will grow further also in the case of a perfect capital market. Unsecured wealth, having originally appeared, has the property of expanded reproduction of itself.

The reason for the further (after the initial jump) unsecured growth of wealth (the difference between wealth and nonfinancial capital $K_f>K_n$, or the difference in returns on assets $r_f>r_n$) is not so significant in our analysis, only the fact of unsecured growth of wealth is important. In the presented model we consider return on capital both in the real and financial sectors of the

economy to be identical, $r_f=r_n\equiv r$.[43] The assumption on the perfect capital market that we use is not contradictory in this case (this assumption is violated only once at the moment of the initial jump in the wealth).

After the abrupt increase in wealth, the rich households in our model will no longer be able to consume all of their additional capital income, so the difference between the wealth and nonfinancial capital (unsecured wealth K_f -K_n) will increase subsequently in periods $1 \le t \le 20$, if all assets generate the same profitability r.

We will consider below three scenarios, differing in the way in which rich households manage additional incomes and in what consequences this lead.

Let us set the initial state of the economy which is identical for all three scenarios. We assume that the population (number of households N) is unchanged, while all employees (one per household) receive the same wage w. In such way we eliminate the factor of rising inequality due to differences in labor income. It is necessary to set some exogenous and normalization constants in our economy:

$$N=100 \quad \text{(E.0.1)}$$
$$w(1)=1 \quad \text{(E.0.2)}$$
$$r=0.05 \quad \text{(E.0.3)}$$
$$g=0.01 \quad \text{(E.0.4)}$$

We will set the initial (directly before the jump-like growth) equilibrium level of total own capital $K_f(-0)$[44] in accordance with a realistic assumption that the capital component α of total net income is 20%, and the labor component is 80% respectively. By the definition, the capital income share is the ratio of capital income to total income, from where $K_f(-0)$ can be calculated:

$$\alpha \equiv rK_f(-0)/[w(1)N+rK_f(-0)], \text{ then}$$
$$K_f(-0) = \alpha\, w(1)\, N/[(1-\alpha)r] \quad \text{(E.0.5)}$$
$$\alpha = 0{,}2$$

Calculate the initial equilibrium distribution of wealth (own capital) between households at the moment t=-0 before jump. Suppose that the share of poor households in total wealth $\rho_w(-0)$ during the balanced growth was 60% percent ($\rho_w(t)\equiv \sum_{i=1}^{90} K_{fi}(t)/K_f(t)$), while 10 wealthy capitalist households (top decile $i\in\{91; 100\}$) had 40% of the total capital, which was evenly distributed among them, so that the wealth of the i-th rich household at the moment t =-0 was:

$$i \in \{91;100\}: \; K_{fi}(-0)=(1-\rho_w(-0))K_f(-0)/10=(1-\rho_w(-0))\,\alpha\, w(1)\, N/[(1-\alpha)r] \quad \text{(E.0.6)}$$
$$\rho_w(-0)=0{,}6$$

For simplicity, let us assign a linearly increasing distribution of the remaining wealth among the non-richest households ($i \in \{1; 90\}$) at the moment t=-0: the first household had zero own capital, and the difference between i-th and (i+1)-th is the same for all of them.

$$i \in \{1;90\}: \quad K_{fi}(0) = A(i-1)$$

Constant A can be calculated based on the fact that all 90 not richest households initially own the known share $\rho_w(-0)$ of the aggregate wealth:

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[43] Model based on the assumption $r_n \neq r_f$ gives similar results.

[44] For the discrete-time model, the value of capital is traditionally measuered at the end of a period. Then, $K_f(-0)$ is the amount of wealth at the end of the zero period before the jump, and $K_f(+0)$ is the wealth after the jump.

$$\rho_w(-0)K_f(-0) = \sum_{i=1}^{90} A(i-1) = A(90\text{-}1)90/2$$

$$A = \rho_w(-0)K_f(-0)/[89\times 45]$$

In this way,

$$i \in \{1;90\}: K_{fi}(-0) = \rho_w(-0)K_f(-0)(i-1)/[89\times 45] \qquad \text{(E.0.7)}$$

Let us define several more important initially given values. During the equilibrium growth of the economy at a constant rate g at the period prior to consideration ($t \leq 0$), households did not change their propensity to save s_i, ($s_i \equiv S_i/H_i$). These historical values will have a significant impact at household consumption also in the future. Knowing the equilibrium amount of the own capital $K_{fi}(0)$ for each i-th household at the moment $t = -0$, one can determine the value of the propensity to save, which is necessary for the accumulation of the corresponding amount of capital. Similar task is discussed in Section 7, see Equation (25). Using this formula, you can easily express the desired propensity to save:

$$s_i = gK_{fi}/(w_i + rK_{fi})$$

For the specific situation under consideration, this formula can be rewritten as:

$$i \in \{1;100\}: \quad s_i(0) = g\,K_{fi}(-0)/(w(1) + r\,K_{fi}(-0)) \qquad \text{(E.0.8)}$$

Derivation of Equations (E.0.5) - (E.0.8) above is based on the assumption of balanced equilibrium economic growth in the time period $t \leq 0$. Wealth inequality is invariable (does not increase) during such growth, which is possible only in the absence of unsecured capital, as we showed in Section 7 (see Theorem 1). Therefore, $K_n(t)=K_f(t)$ for $t \leq 0$, that is:

$$K_n(-0)=K_f(-0) \qquad \text{(E.0.9)}$$

We describe further the sharp unsecured increase in wealth that occurred according to our assumptions in the time interval $0< t <+0$. Let us assume that the primary jump of wealth increased the own capital only among the wealthiest capitalists, while the wealth of the remaining 90 remained unchanged:

$$i \in \{1;90\} \qquad K_{fi}(+0) = K_{fi}(-0) \qquad \text{(E.0.10)}$$

Suppose also that the jump led to a "moderate inequality" in Piketty's terminology: 10 wealthy capitalist households at the time $t=+0$ after the jump began to own 60% of the total wealth. Then the unchanged amount of the total wealth of the poor 90 households amounts now the share $\rho_w(+0)$ of 40% of the increased value of aggregate national wealth $K_f(+0)$:

$$K_f^w(+0) = K_f^w(-0) = \rho_w(-0)K_{fi}(-0) = \rho_w(+0)K_f(+0), \text{ from where}$$

$$K_f(+0) = \rho_w(-0)K_{fi}(-0)/\rho_w(+0) \qquad \text{(E.0.11)}$$

$$\rho_w(+0) = 0{,}4$$

The remaining 60% of wealth is evenly distributed among rich households:

$$i \in \{91;100\}: \quad K_{fi}(+0) = (1-\rho_w(+0))K_f(+0)/10) = (1-\rho_w(+0))\,\rho_w(-0)K_{fi}(-0)/[10\,\rho_w(+0)] \qquad \text{(E.0.12)}$$

It is obvious that the total value of nonfinancial assets did not change at the moment t = 0:

$$K_n(+0)=K_n(-0) \qquad \text{(E.0.13)}$$

E2. First scenario

The first scenario is presented in the first table "Scenario 1"in the attached Excel file "Numerical simulation of the rising inequality dynamics".

The initial (at time t=+0) values of wage $w(1)$, wealth $K_{fi}(+0)$, nonfinancial capital $K_n(+0)$ and propensity to save s_i are the same for all scenarios, including the first, and calculated by using Equations (E.0.2) and (E.0.7) - (E.0.13). Calculations of the values of some variables (income, consumption and savings by household, as well as total capital investment, total output and unsecured income) in the given period t, starting from the 1st, are made further on the basis of the data at the beginning of the period. As a result, we determine the households' own capital K_{fi} at the end of the current period; these values are initial ones for the next period. Thus, all periods are calculated sequentially, using recurrence equations.

The calculation order is as follows: first, we calculate the total income H_i for the i-th household, consisting of labor and capital components:

$$i \in 1\text{-}100\text{: } H_i(t) = w(t)+rK_{fi}(t\text{-}1) \qquad \text{(E.1.1)}$$

We believe the capital market is perfect, that is, the rate of return on all assets is the same and equal to the percentage that must be paid on existing liabilities. The difference between the values of assets and liabilities is the own capital of the entity. Therefore, the income of the i-th household from the ownership of assets, less the expenses of servicing the liabilities, will be equal in our case to the income that generates the own capital (wealth) of this household K_{fi}.

The first scenario is different from other by "inertial" logic of households' consumption in the analyzed periods of time ($1 \le t \le 20$). It is assumed that 90 poor households do not change their propensity to save, keeping it at an equilibrium level $s_i(0)$:

$$i \in 1\text{-}90\text{: } s_i(t)= const=s_i(0) \qquad \text{(E.1.2)}$$

Then we calculate the consumption C_i of i-th poor household which is determined by their income H_i and propensity to save:

$$i \in 1\text{-}90\text{: } C_i(t)= H_i(t)(1-s_i(t)) \qquad \text{(E.1.3)}$$

Ten wealthy households will not be able to maintain their historical propensity to save, having a rapidly growing income, which they are unable to consume. We assume that the growth in consumption of these households is also inertial, that is, their consumption is proportional to the consumption of poor households. Then the ratio of consumption of any of the rich households to the consumption of a certain poor one, namely the 90th, will remain at an equilibrium level, so that:

$$i \in 91\text{-}100\text{: } C_i(t)=C_{90}(t)k \qquad \text{(E.1.4)}$$

The coefficient k is the ratio of the consumption of the 100th household to the consumption of 90th for any period of the equilibrium growth. Equilibrium consumption values (with index eq) can be calculated hypothetically for the 1st period, assuming the equilibrium values of the own capital $K_{fi}(-0)$ for this period:

$$k=C_{eq100}/C_{eq90}=H_{eq100}(1-s_{100})/[H_{eq90}(1-s_{90})]=$$
$$=[w(1)+rK_{f100}(-0)](1-s_{100})/\{[w(1)+rK_{f90}(-0)](1-s_{90})\} \qquad \text{(E.1.4a)}$$

We believe that events in the financial sector (the growth of unsecured wealth) do not affect the processes of production in the real sector. Therefore, the aggregate real net output Y_{net} continuously grows at a constant rate g due to exogenous technical progress with a constant amount of labor. The total amount of nonfinancial capital increases at the same rate g as the output (the ratio of nonfinancial capital to the issue of K_n/Y remains). To ensure such growth, the amount of net investment I_{net} should be equal to

$$I_{net}(t)=gK_n(t\text{-}1) \qquad \text{(E.1.5)}$$

Calculate the (net) output Y_{net} of the given period t. Note that the calculations of the aggregate output through total income or through total expenses are equivalent:

$$Y_{net}(t)=C(t)+I_{net}(t) =w(t)N+rK_n(t\text{-}1) \qquad \text{(E.1.6)}$$

Next, you can calculate the amount of the unsecured income ΔH:

$$\Delta H(t) = H(t) - Y_{net}(t) \qquad \text{(E.1.7)}$$

$$\text{where } H(t) = \sum_{i=1}^{N} H_i(t)$$

The own capital of household K_{fi} at the end of the given period grows due to the savings made by these households, which are equal to the difference between their income and consumption. In the absence of inflation:

$$i \in 1\text{-}100\text{: } K_{fi}(t)=K_{fi}(t-1)+H_i(t) - C_i(t) \qquad \text{(E.1.8)}$$

Nonfinancial capital is accumulated at the expense of investment, and in the absence of inflation get:

$$K_n(t)= K_n(t-1)+I_{net}(t-1) \qquad \text{(E.1.9)}$$

It remains to set a recursive formula for wages. Since we assume equilibrium balanced growth in the real sector of the economy, real wages should grow at the same rate as labor productivity, equivalent to the growth g of total output with a constant amount of labor:

$$w(t)=w(t-1)(1+g) \qquad \text{(E.1.10)}$$

The calculations in the table “Scenario 1” show that the inequality for this scenario is rising. Indeed, the net worth K_f^c of wealthy households is growing faster than of the poor K_f^w. For 20 years these two values increased by 2.016 and 1.22 times respectively (the latter value corresponds to the growth of the real sector of the economy ($(1+g)^{20}=1{,}01^{20}=1.22$). Wealth inequality between households has increased, wealthy households from the top decile are already concentrated about 71.3% % of the wealth, instead of the original 60%.

Due to the accelerated growth of own capital of the wealthy households, total wealth grows faster than the own capital of poor households, which in turn grows at the same rate g as nonfinancial capital and output under the first scenario. Therefore, the aggregate wealth K_f grows faster than the total nonfinancial capital K_n:

$K_f(20)/K_f(+0)=1.698$

$K_n(20)/K_n(0)=1.22$

The ratio K_f/K_n therefore increases from $K_f(0)/K_n(0)$ =1.5 to $K_f(20)/K_n(20)$= 2.087; the increment is $[K_f(20)/K_n(20)]/[K_f(0)/K_n(0)]$= 1.391.

We have shown above that the part of the increase in total wealth, exceeding the increase in total nonfinancial capital, is not secured. The unsecured part of wealth is a source of potential inflation, the value of which corresponds to an increase in the ratio K_f/K_n. This ratio cannot grow infinitely. Wealth and nonfinancial capital can be brought into line with each other either by inflation (appreciation of nonfinancial assets), or by reduction financial assets prices. We use the option of reducing the price of financial assets, after 20 periods, by the value of the K_f/K_n ratio increase (by 1.391 times) for the first scenario. Thus adjusted value of equity will be called normalized, with the index "*norm*":

$$K_{fi\ norm}(t) \equiv K_{fi}(t)/\{[K_f(+0)/K_n(+0)]/[K_f(t)/K_n(t)]\} \qquad \text{(E.1.11)}$$

In this case, the real growth (less potential inflation) of the own capital of low-income households ($i \in$ 1-90) will be $K_{finorm}(20)/K_{fi}(0)$= 0.877,[45] which is significantly less than the growth of nonfinancial capital and output, which grew 1.22 times. The real wealth of wealthy households, on the contrary, will grow at a pace that is faster than output, and will grow 1.449 times in 20 years. It means that the wealth inequality increases.

Nevertheless, despite the rising inequality, 90 poor households retain non-negative equity, that is, they are not potential bankrupts. The distribution of the total product between the rich and the poor (the share of their consumption) is preserved over time for the first scenario.

E3. Scenarios which include inflation. The mechanism of demand-pull inflation[46]

The following two scenarios are more complicated. They include inflation associated with the unsecured income. This paragraph is intended to clarify the proposed mechanism for the emergence of inflation, and to clear up the calculations used to simulate the second and third scenarios.

Balanced growth of the real sector of the economy at a constant rate is assumed in the all scenarios considered in this appendix. Physical output grows in proportion to the uniform increase in labor productivity and to the real value of fixed assets (nonfinancial capital); real wages grow at the same pace.

For clarity, we begin the consideration of the mechanism of inflation with a description of the trivial case when inflation is absent. This refers to the equilibrium growth of the economy when supply and demand coincide, and when the unsecured income and capital equal to zero. Producers plan the physical volume of output based on the prevailing trend of its uniform growth. Household income, and therefore their consumer demand are growing at the same rate, in line with the growth of their wages. In simple terms, the physical quantity of goods and services is growing at the same rate as the amount of money intended for their purchase. That is, prices are stable, and there are really no reasons for inflation.

Having unsecured income complicates the situation. In this case total household income is growing faster than the physical output of goods and services. But this does not necessarily mean that consumer demand will also grow at a faster pace relative to real output of commodities. For the 1st scenario discussed in the previous paragraph, excess and unsecured income is exactly equal to the unsecured increase in the value of financial assets. Thus, the excess income turns out to be “absorbed” (or “tied”) by savings of households – owners of these financial assets; so this income does not spill out onto the consumer market in the form of additional demand that provokes inflation.

Unlike the first, for the second and third scenarios we will assume that wealthy households will decide to spend some of their excess income for an additional consumption; this will increase

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[45] The real capital of poor households in this case has decreased. This happens if the real sector is growing slower than potential inflation (K_f/K_n ratio)

[46] Inflation can have various reasons. Here we consider only the mechanism associated with an increase in aggregate demand due to additional unsecured income.

aggregate consumer demand. After all, the rapid growth in the value of financial assets really must inspire optimism and contribute to the growth of demand. Savings are the result of individual consumer decisions of households, so actual savings will not necessarily be so large as to "absorb" the entire excess income. A part of this excess income may increase the consumer demand. In this case, the increased aggregate consumer demand will exceed aggregate supply of goods and services at the pre-existing prices of the previous period. Market clearing mechanisms will inevitably equalize the discrepancies that have arisen, so that actual aggregate consumer demand and supply will be identical eventually. This equalizing may occur: (a) due to an increase in physical output (supply) from producers, or (b) due to a rise in prices for consumer goods and, possibly, (c) due to a slight decrease in demand due to the above mentioned in variant (b) prices increase. In the real economy, all these mechanisms can take place simultaneously. In the presented model, we left only one mechanism - the rise in prices. Firstly, we believe that households consume in each period all the produced output, i.e. inventories are permanent or absent. Second, we consider the inelastic physical output of consumer goods; that it strictly corresponds to the planned one, and does not have time to change in one direction or the other due to changes in consumer demand in the current period.[47] Therefore, the result of the deviation of consumer demand from supply can only be a rise in prices for consumer goods.

Scenarios with inflation are considered in the same attached Excel file "Numerical simulation of the rising inequality dynamics". The initial wage value $w(1)$, the households' wealth $K_{fi}(+0)$, total nonfinancial capital $K_n(+0)$, and the values of their propensity to save s_i, are identical to the corresponding values for the first scenario, in accordance with the Equations (E.0.2) and (E.0.7) - (E.0.13). If household wages and equity are known, their net income H_i can be calculated similarly to the first scenario, according to formula E.1.1.

Further calculations for each time period are carried out in two stages. At the first stage, the values of consumer demand ($C'_{i\ dem}$) and supply (C'_{sup}), net output (Y'_{ne}) and excess income ($\Delta H'$) are calculated preliminary, excluding inflation, in the same way as in the 1st scenario. Such pre-calculated values are marked with an apostrophe. Equations similar to (E.1.3) and (E.1.4) can be used to calculate $C'_{i\ dem}$:

$$i \in 1\text{-}90: C'_{i\ dem}(t) = H_i(t)(1 - s_i(t)) \qquad \text{(E.2.1)}$$

$$i \in 91\text{-}100: C'_{i\ dem}(t) = k \times C'_{90\ dem}(t) \qquad \text{(E.2.2)}$$

$k = C_{eq100}/C_{eq90}$, see Equation E.1.4a

Pre-calculated value of the aggregate net output can be calculated similar to equation (E.1.6):

$$Y'_{net}(t) = w(t)N + rK_n(t\text{-}1) \qquad \text{(E.2.3)}$$

The net capital investment in the real sector I_{net} t is determined, as before, using the formula (E.1.5). As a rule, investment agreements are long-term in nature; therefore we believe that their value will not change in the current period due to increased consumer demand. Then the total cost (at the pre-existed in the previous period prices) of consumer goods that the business produced for sale in the current period will be:[48]

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[47] We understand that such an assumption does not correspond to the actually observed data. Nevertheless, we "switched-off" the feedback between short-term changes in household demand and business production plans to focus on the equilibrium trend, excluding from consideration cyclical fluctuations in output and employment.

[48] It is easy to verify that the pre-calculated aggregate supply of consumer goods and services grows relative to actual consumption of the previous period in proportion to the increase in physical output, without changing prices, $C'_{sup}(t) = C(t\text{-}1) \times (1\text{-}g)$.

$$C'_{sup}(t) = Y'_{net}(t) - I_{net}(t) \quad \text{(E.2.4)}$$

Next, we calculate the excess part of total income $\Delta H'$, that is the difference between total net income and total net value added, similar to equation (E.1.7):

$$\Delta H'(t) = H(t) - Y'_{net}(t) \quad \text{(E.2.5)}$$

where $H'(t) = \sum_{i=1}^{N} H'_i(t)$

We assume that rich households will consume an additional 20%[49] of their excess income. Hence the aggregate demand will increase by ΔC:

$$\Delta C(t) = k_{\Delta C} \times \Delta H'(t) \quad \text{(E.2.6)}$$

$k_{\Delta C} = 0{,}2$

The physical volume of produced and sold consumer goods does not have a time to change due to the changes in demand in the current period of time in our model. Then the additional effective demand ΔC will cause an increase in the index D of consumer prices in this period:

$$D(t) = C(t)/C'_{sup}(t) = [C'_{dem}(t) + \Delta C(t)]/C'_{sup}(t) = [C'_{sup}(t) + \Delta C(t)]/C'_{sup}(t) \quad \text{(E.2.7)}$$

Note that in this case, unlike the 1st scenario, the initial excess income is divided into two components: one of them, which is equal to ΔC, increases nominal consumption and causes inflation; the remainder is unsecured income that increases unsecured wealth.

We described above the first stage, that is, the preliminary calculation of the values, and the calculation of the level of inflation. The formulas obtained are applicable to both (second and third) scenarios discussed below. Further dynamics largely depends on the reaction of 90 of not richest households to price increases. In this regard, we consider two scenarios for the behavior of these households: "thrifty" (scenario 2) and "wasteful" (scenario 3). In a thrifty scenario, poor households keep the same nominal amounts of consumption and savings as for the first scenario (without inflation). In the wasteful scenario, poor households do not agree with lowering their real consumption and their status in society, and strive to maintain their level of consumption relative to its average value. We represent these two scenarios below.

E4. Second (thrifty)scenario

The scenario assumes a thrifty strategy for 90 not richest households, when the nominal value of their consumer spending does not change due to price changes.

Based on this, we will calculate the actual nominal level of household consumption C_i, assuming that the additional (nominal) consumption, equal to ΔC, is evenly distributed between only ten households in the top decile. When denoting actual consumption values, we do not use the *demand /supply* index, since the actual nominal consumption on the supply and demand side must be the same.

$$i \in 1\text{-}90: \quad C_i(t) = C'_{i\,dem}(t) \quad \text{(E.2.8)}$$

$$i \in 91\text{-}100: \quad C_i(t) = C'_{i\,dem}(t) + \Delta C(t)/10 \quad \text{(E.2.9)}$$

We next calculate the nominal values of the wealth, K_{fi} and of the nonfinancial capital K_n which are accumulated at the end of the period under review. It is necessary to take into account

[49] Changes in the value of this coefficient does not lead to qualitative changes in the dynamics.

inflation, for which we carry out additional overvaluation of the nonfinancial capital in accordance with the growth of consumer prices in $D(t)$ times:

$$K_n(t)=[K_n(t\text{-}1)+I_{net}(t\text{-}1)]D(t)=[K_n(t\text{-}1)+gK_n(t\text{-}1)]D(t)=K_n(t\text{-}1)(1+g)D(t) \qquad \text{(E.2.10)}$$

Together with the inflationary growth of the nominal value of nonfinancial assets, the value of financial assets and household wealth should also increase. We assume that the additional growth of household own capital associated with inflation is at the same rate $D(t)$ as inflation growth of nonfinancial capital, while household incomes for the current period H_i are not recalculated.[50]

$$K_{fi}(t)=[K_{fi}(t\text{-}1)+S_{fi}(t)]\ D(t)=[K_{fi}(t\text{-}1)+H_i(t)-C_i(t)]\ D(t) \qquad \text{(E.2.11)}$$

The nominal value of wages should also increase due to the growth of consumer prices. We assume that this happens with some delay, so that the nominal wage in the subsequent period grows additionally relatively real by the value of the inflation index of the previous period; at the same time, real wages are growing at the rate of growth of labor productivity g.

$$w(t+1)= w(t)(1+g)D(t) \qquad \text{(E.2.12)}$$

It is advisable to take into account the real values of variables, which we will mark with a subscript r, together with their nominal values, for an objective assessment of the situation. We explain below the method of the corresponding calculations.

Real values are used to account for physical objects. This theoretically implies accounting in physical units. The value of an asset in this case is defined as the product of its real quantity (pieces, for example) by its current price, taking inflation into account. However in practice, it is extremely difficult to keep aggregated records of real quantities due to the huge variety of primary accounting objects.

Therefore, it is more convenient and more logical to imply asset value in prices for a certain period as a real asset value; such accounting is most often done in the systems of national accounts. In this case, the corresponding variables acquire the property of homogeneity. We will call the value of assets in the prices of the original (zero) period as their real value.

Then the real and current nominal value of the asset under consideration at the end of the period t is related to each other by the amount of the total price increase over all past periods. The total increase in prices for the given time period t (price index P) is equal to the product of the corresponding increments of all periods starting from 1st is:

$$P(t)=\prod_{\tau=1}^{t} D(\tau) \qquad \text{(E.2.13)}$$

And the real values of consumption $C_{ri}(t)$, wealth $K_{rfi}(t)$ and non-financial capital $K_{rn}(t)$ at the end of any period t can be calculated:

$$C_{ri}(t)=C_i(t)/P(t) \qquad \text{(E.2.14)}$$

$$K_{rfi}(t)=K_{fi}(t)/P(t) \qquad \text{(E.2.15)}$$

$$K_{rn}(t)=K_n(t)/P(t) \qquad \text{(E.2.16)}$$

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[50] Instead of revaluation of wealth, you can recalculate the profit received by the owners of capital, which increases due to the inflationary rise in the price of realizable consumer goods. The resulting value of wealth in this calculation will not change. The method of wealth revaluation used by us for accounting of its inflationary increase is simpler.

The calculations for the second scenario in the corresponding table of the attached Excel file, in accordance with the above logic, demonstrate the following: The portion ΔC of the excess income $\Delta H'$ increases consumer demand, causing inflation. The remaining part of the excess income $\Delta H=\Delta H'-\Delta C$ is absorbed by the financial assets; in this case the ratio of wealth to non-financial capital K_f/K_n is growing. It is this part of ΔH of excess income that is unsecured income in our terminology.

Compared with the first scenario, the ratio K_f/K_n grows weaker (1.265 times as a result; in the first scenario, the total growth is 1.391 times). Such a slowdown in the growth rate of the financial bubble is accompanied in the second scenario by a tremendous price increase of 1.734 times. The ending real values of total consumption, total nonfinancial capital and normalized (reduced by the amount of the total increase in the K_f/K_n ratio) total wealth for both scenarios coincide.

Thrifty behavior of poor households in the second scenario leads to two differently directed consequences. Inequality in income distribution increases and inequality in wealth distribution decreases (relative to the first scenario). Keeping constant their propensity to save, these households thereby reduce their real consumption. As a result, the share of the top deciles of rich households in total consumer spending is gradually increasing, reaching a total of 18%; for the first scenario, this proportion is constant at 15%. However the share of total wealth owned by wealthy households for this scenario does not grow as fast as in the first scenario. As a result, this share at the end of the 20th period reaches 68.4% in the second scenario, which is less than 71.3% for the first.

Thus, the inequality resulting from the emergence of unsecured financial income does not go anywhere, but only slightly modified in the second scenario. Reducing the growth rate of wealth inequality is transformed into acceleration of inequality in living standards.

We consider the second scenario as unlikely. It is scarcely that poor households will easily give up in favor of the rich from part of their real consumption; we believe that they will fight to maintain their status quo, trying to prevent a decline in real consumption relative to the average.

E5. Third (wasteful) scenario

The thesis about maintaining the poor households' status quo pushed to the limit for the third scenario. We assume that there is no redistribution of real consumption in the favor of wealthy households, despite the increase in their effective demand. Poor households will not want to reduce their share of consumption, despite rising prices. We believe that this scenario corresponds to human psychology. For example, the household planned to purchase a washing machine in the current period. The washing machine has risen in price, but the household will still purchase it (on credit), based on the promised salary increase in the next period. Such consumer behavior of poor households is promoted by their misleading positive cash flow, taking place thanks to consumer and other loans, amid negative net savings; it seems that everything is in order, as there is enough money today.

Of course, our assumption that households do not adjust their physical consumption in any way due to rising prices is extreme. Nevertheless, the consideration of such a scenario makes it possible to identify characteristic trends indicating a potential threat of bankruptcy of the poorest households in this case.

So, poor households retain their expected (physical) consumption, despite inflation, therefore, their actual nominal consumption C_i will increase in line with the price increase. For the third scenario, instead of equation (E.2.8) for the second one, we have:

$$i=1\text{-}90 \qquad C_i(t)= C'_{i\ demand}(t)D(t) \tag{E.3.1}$$

Wealthy households will consume the remaining volume of output at increased prices, so the consumption of any of them, can be expressed:

$$i=91\text{-}100 \quad C_i(t)= [C'_{sup}(t)D(t) - \sum_{i=1}^{90} C_i\ (t)\ ]/10 \qquad \text{(E.3.2)}$$

The last equation is intended to replace equation (E.2.9) for the second scenario; however, a slightly different method is used to calculate the consumption of rich deciles. This is due to the features of the third scenario, which we will not go into in detail here; if the consumption of the rich for this scenario is calculated in accordance with equation (E.2.9), then, for a number of reasons, the total consumption will be slightly less than the volume of consumer goods produced with inflation, $C(t)\neq C'_{supply}(t)D(t)$. Not everything produced will be consumed, the inventories will change, the production plan will be adjusted, and employment will change. All this is evidence of the deviation of the dynamics of the real sector of the economy from the equilibrium trend. And we do not want to complicate our model by considering non-balanced processes in the real sector, so we will use equation (E.3.2).

The rest of the third scenario is no different from the second one. Therefore, in order to save space, we will not rewrite the equations used for both the first and second scenarios. To calculate the values of H_i; $C'_{i\ demand}$; Y'_{net}; C'_{supply}; $\Delta H'$; ΔC; D; P; K_n; K_{fi}; w, Equations (E.1.1); (E.2.1) and (E.2.2); (E.2.3); (E.2.4); (E.2.5); (E.2.6); (E.2.7); (E.2.10); (E.2.13); (E.2.11); (E.2.12) are used respectively.

Most of the aggregated macroeconomic indicators, which are obtained as a result of calculations in the third scenario and given in the corresponding table in the attached Excel file, coincide with the corresponding values for the second scenario. Only the values characterizing inequality in income and wealth differ.

The poorest households in the third scenario are increasing their debts having the perspective of bankruptcy. Inequality in the distribution of wealth between the rich and the poor increases compared with the second scenario; the wealthy own 73.8% of all wealth, compared with 68.4% in the second scenario. On the other hand, not the richest households manage to save a larger share of consumption relative to the second scenario (the rich in the third scenario consume the share of 17%, and in the second - 18%).

Thus, the wasteful behavior of poor households in the third scenario leads to two differently directed consequences, the opposite to the consequences of the second scenario. Inequality resulting from the emergence of the excess and unsecured financial income does not go anywhere, but only changes in this case also.

The third scenario, being the most plausible, at the same time leads to the worst consequences. Both income inequality and wealth inequality increase compared with the first scenario. In addition, the seven poorest households at the end of the 20th period are already potential bankrupt, having a negative own capital. The number of such households grows with time, and more and more households have negative savings. Thus, stimulating consumer demand of low-income households is dangerous and can provoke instability in the economy.

Appendix F. Paradoxes of the US statistics (FOF accounts)

This appendix discusses the methodological difficulties arising from the simultaneous accounting of flows and stocks in the Flow of Funds account system of the US Federal Reserve. Most clearly these problems come out in assessing the value of the US corporate business. How much do corporations actually cost? It turns out that in the current conditions of financialization of the economy, this question is often difficult to answer, even in relation to US nonfinancial corporations, which are the basis of the real sector of the American economy and are audited annually.

Evaluation of corporate business by the income method, which necessarily follows from the principles of functioning of the modern stock market, falls out of a coherent accounting system based on accounting principles. Unreasonable use of shareholder value as the value of a corporate business can lead to obvious errors. As an example, let us cite the statistical flow of funds data of the US Federal Reserve System, (Flow of Funds accounts) which since 2015 were supplemented by table B.1 reflecting the aggregate national wealth. The wealth in the table is

calculated as a total value of the nonfinancial assets owned by all economic actors (households, noncorporate business and government), excluding corporate business. The part of the total wealth attributable to the corporations is valued in another way: according to their aggregate market shareholder value.

Such an approach allows arbitrary manipulations on the value of national wealth, which is easy to demonstrate. Suppose that you own a number of corporations. Then, remaining their owner in fact, you legally complicate the ownership structure by establishing a holding company, which becomes the nominal owner of your corporations. Common sense suggests that the real national wealth has not changed after such doing. But the total shareholder value of all corporations has increased by the value of the shares of the new holding company; consequently the total wealth in table B.1 also had to increase.

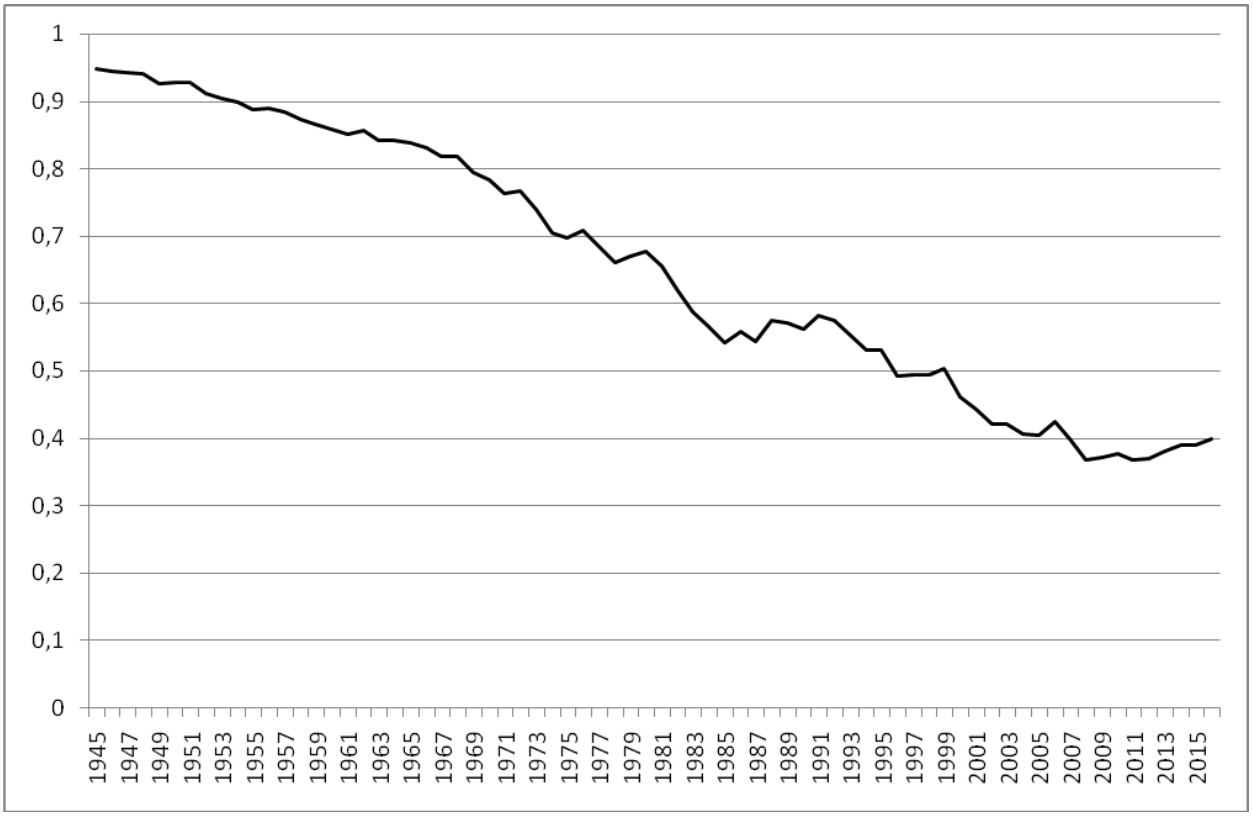

Figure F1Share of total shareholder value directly owned by US households. Data Sources are in Appendix G.

Registration of the holding financial companies, as well as mergers and acquisitions, can remove, and had removed in fact a certain portion of the shares from the ownership of the final owners-households. The fact that this mechanism actually takes place is indirectly indicated also by the decline in the share of shareholder value owned directly by households. The figure shows that less than 40% of the total shareholder value in the US was owned by households in 2016; in 1945 households owned 95% of all equities, see figure below.

The fact that the above described mechanism can actually take place is evidenced by the large net issue of financial corporations' shares (Δ), due to which their own capital (●) and shareholder value (○) are growing starting from the 1980s, see the figure below.

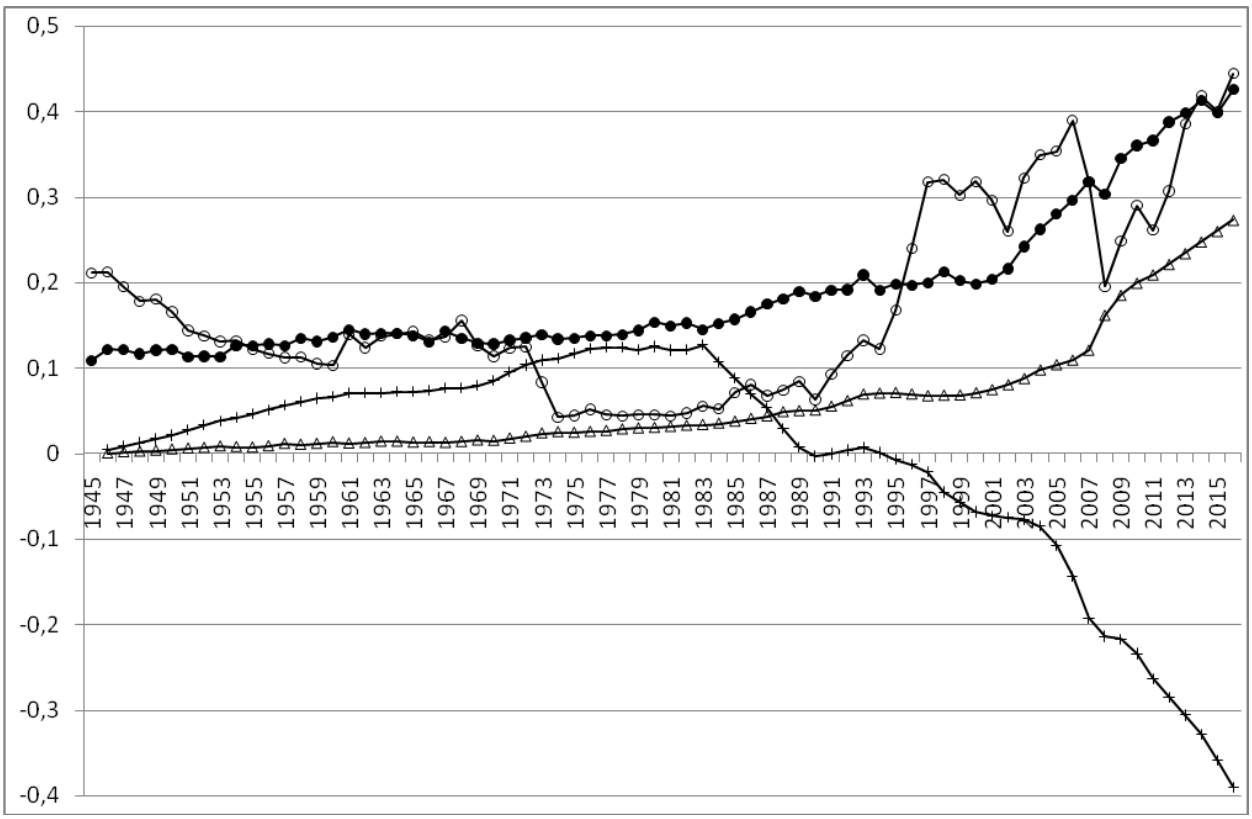

Fig F2 Net issue of shares of nonfinancial (+) and financial (Δ) US corporations cumulative total; aggregated shareholder value (○) and own capital (●) of financial corporations; all in GDP units. Data Sources are in Appendix G.

The curve (+) in the figure shows, that the net issue of shares of nonfinancial corporations has been stably negative since the 1980s. Nonfinancial corporations mainly redeem old issues of their shares, rather than issue new ones. The additional demand for stocks created in this way contributes to the growth of their price, in which corporate management often has personal interest, having appropriate stimulating options. It follows from the foregoing, that the stock market is not free and competitive, which means that market prices for shares of nonfinancial corporations cannot be trusted.

So, we once again justified the thesis about the unreliability of assessing the value of corporations at their shareholder value. Is it correct to evaluate the value of these enterprises by the value of their own capital? It turns out that even corporate equity cannot always be calculated with satisfactory accuracy, when financialization of the economy is as high as now. This is evidenced by the "detective story" with the Fed changing its methodology for calculating the value of financial assets and liabilities in the balance sheet of non-financial corporations in 2019, mentioned in section 8 (see Fig. 5). The reasons for changing this technique are not clear to us.[51] After all, the accounting of US corporations is quite reliable; they are required to undergo an annual audit to confirm their assets and liabilities.

Corrections in the methodology have fundamentally changed the own capital of nonfinancial corporations. For example, the value of this variable for 2016 decreased in the release for December 2019 by almost $ 8 trillion (by more than a third) compared with the same value in the release for September 2017, see figure below.

[51] Explanations in the FOF September 2019 release: *The nonfinancial corporate sector (tables F.103, L.103, B.103, and R.103) has been revised from 2010:Q1 forward based on improved methodology using data from the IRS Statistics of Income and Census Quarterly Financial Report*

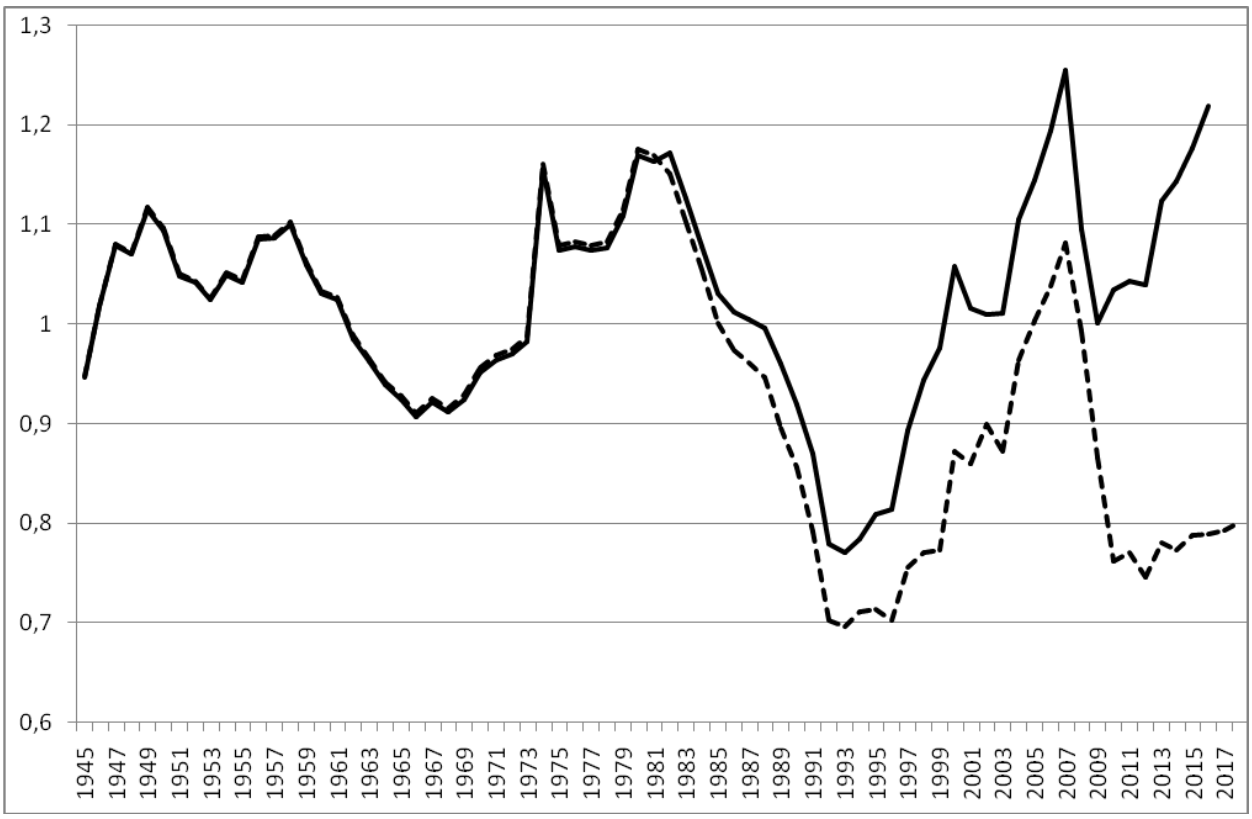

Fig F3 The aggregate own capital of U.S. nonfinancial corporations in units of GDP: according to the release of Sep 21, 2017 (solid line), and according to the release of Dec, 20, 2019 (dashed line). Data Sources are in Appendix G.

Such a significant reducing of the own capital of nonfinancial corporations is surprising. The decrease in equity (with constant profit) automatically significantly increases its return, which from 2005 to 2018 did not fall below 5%, and in 2012 reached an unimaginable 8.5%. Return on equity in a competitive economy should be comparable to return on investment in the real sector. And if the capital investment is profitable then it should also be great. But for some reason, new investments in the real sector of the economy are negligible, see the curve with a marker (○) in Fig. 7. Something is wrong here!

An analysis of changes in the balance sheet of nonfinancial corporations as a result of adjustments to the Fed's methodology shows that a decrease in their own capital occurred due to a decrease in the net value of their financial assets (financial assets less the liabilities). More precisely, it happens by reducing the value of miscellaneous unidentified financial assets, and by increasing the liabilities associated with the issue of such assets. This type of financial instrument is a potential source of unsecured wealth, which is located primarily on the balance sheet of nonfinancial corporations; this conclusion is made in Section 8. The corresponding Fig. 5 demonstrates the shocking magnitude of the discrepancies between the value of financial assets and liabilities securing these assets. The lion's share of this discrepancies relate specifically to miscellaneous unidentified financial assets. These discrepancies were reduced as a result of adjustments to the Fed's methodology, while reducing the unsecured portion of the wealth of nonfinancial corporations.[52]

[52] The discrepancy between assets and liabilities for miscellaneous unidentified financial assets for 2016 decreased by almost the same amount by which the own capital of nonfinancial corporations decreased (about $ 8 trillion).

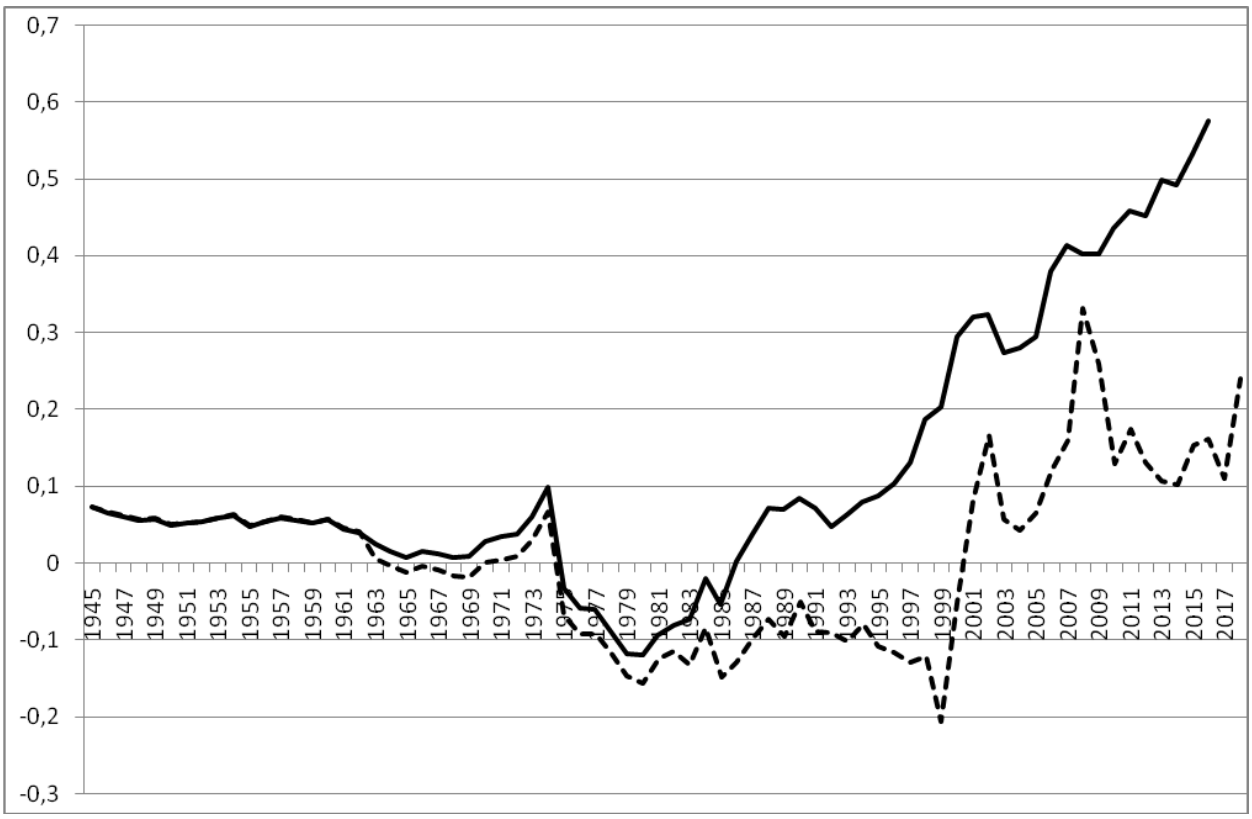

Figure F4 USA Difference between the total value of miscellaneous unidentified financial assets and the liabilities securing them (in units of GDP): in accordance with the release of Sep 21, 2017 (solid line) and in accordance with the release of Dec, 20, 2019 (dashed line). Data Sources are in Appendix G.

At first glance, it might seem that a change in the methodology for calculating the value of financial assets and liabilities may change (in our case, reduce) the amount of unsecured wealth. But this, of course, is not so. Tightening in one place, it simultaneously increased in another. Due to the decrease in the own capital of nonfinancial corporations, the difference between the shareholder value of these corporations and their equity increased by the same amount. Unsecured wealth, initially concentrated in the unsecured value of miscellaneous assets, has not gone away, but has moved to the shareholder value of nonfinancial corporations, see Figure F5.

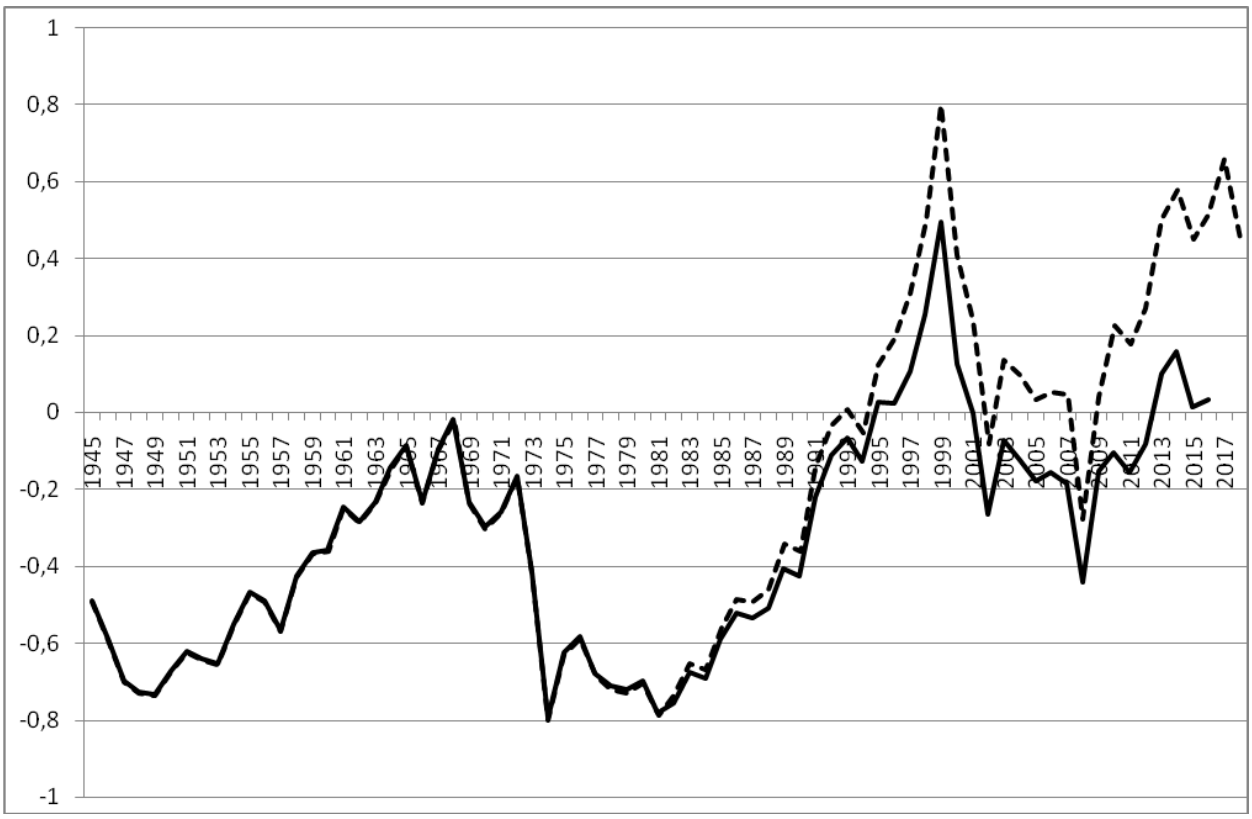

Figure F5 Unsecured component of the shareholder value of nonfinancial US corporations (in units of GDP): according to the release of Sep 21, 2017 (solid line), and according to the release of Dec, 20, 2019 (dashed line). Data Sources are in Appendix G.

A brief analysis carried out in this appendix casts doubt on the possibility of a somewhat plausible assessment of the value of some financial instruments, and, accordingly, an assessment of the own capital of economic entities using such instruments. The existing total financialization of the economy means the inability of an exact answer to the question about the value of a particular enterprise, and about the wealth of a particular person. And it is not possible to "hide" the unsecured wealth that appears as a result of such financialization of the economy, by changing the methodology for valuing assets.

Appendix G Data Sources

All the numerical data presented in this paper are the result of the calculations done by the author by using the data that can be retrieved from the:

— Flow of Funds Accounts of the United States (FOF); Z.1 Statistical Release for Sep 21, 2017; http://www.federalreserve.gov ; all data except the GDP price index is taken from this source. Appendix F additionally provides some data from Statistical Release for Dec 20, 2019.

— NIPA Tables and NIPA Fixed Assets tables that are published by the US Bureau of Economic Analysis, http://www.bea.gov , (NIPA); only GDP price index is taken (A191RG3)

—2008 SNA standard is available at https://unstats.un.org/unsd/nationalaccount/sna2008.asp

The data used and figures obtained in this work are given in the attached Excel file "Statistical data". The annual calendar year time series at current prices are used. All inventory values are presented at the end of the reporting period.

A brief description of data processing techniques for plotting graphs (Figures 1, 2, 4-6) is provided below, indicating the names and codes of the original data series.

Designations and abbreviations used:

Gross domestic product FA086902005.A: *Y*

Private domestic sectors; gross fixed investment and inventories FA835019905.A *I*

All domestic sectors; corporate equities; liability LM883164105.A	*Eq*
Gross domestic product Price Index A191RG3 (NIPA)	*P*
Sectors:	
Domestic business	*DB*
Households and nonprofit organizations:	*HN*
Nonfinancial corporate business:	*NFCB*
Nonfinancial noncorporate business:	*NFNCB*
Domestic financial sectors:	*FB*
General government:	*GnG*
Federal government	*FdG*
State and local governments	*StG*
Rest of the world:	*RW*
Other abbreviations:	
Instrument discrepancies	*ID*

Figure 1 The total value of the US corporations relative to GDP is calculated in two ways: ♦ shows the aggregate net assets (equity) of all corporations; ■ shows total market shareholder value of all corporations.
Both values are adjusted for the accumulated at the reporting date *t* value of the net issue of shares in units of GDP (cumulative total from the beginning of the time series)

♦	{[*NFCB*; net worth FL102090005.A]+[*FB*; nonfinancial assets LM792010095.A]+[*FB*; total financial assets FL794090005.A]–[*FB*; total liabilities FL794190005.A]}/*Y*– Σ(*NI*/*Y*)
■	[*DB*; corporate equities; liability LM883164105.A]/*Y* – Σ(*NI*/*Y*)

$\Sigma(NI/Y)(t)=\sum_{\tau=t_0}^{t} NI(\tau)/Y(\tau)$, *NI*=[*NFCB*; Net issues, corporate equities FA103164103.A]+

[*FB*; Net issues, corporate equities FA793164105.A]

Figure 2. US Relative changes of gross private investments *I* (▲) and of total shareholder value *Eq* of corporations, which is shifted (lagged) by a year later (+).Changes in the total shareholder of corporations are adjusted for the value of the net issue of their equities. For a billing period *t*:

▲	[*I*(*t*)–*I*(*t*–1)]/*I*(*t*–1)
+	{[*Eq*(*t*–1) –*NI*(*t* –1) –*Eq*(*t*–2)]/*Eq*(*t*–2), value of *NI* is described in the data Fig. 1

The calculations of the correlation coefficient between the indicated values for the period of time from 1949 to 2016 was made by means of the Excel in the attached file "Statistical data".
Figure 4. US Total household savings (dash-and-dot line); household net lending net of dividends paid (solid line); state budget deficit (dashed line).

Dash-dot line	[HN; net saving FA156006005.A]/*Y*
Dotted line	{[HN; net lending (+) or borrowing (-) (capital account) FA155000905.A] –[*HN*; dividends received FA156121101.A]}/*Y*
Solid line	[*GnG*; net lending (+) or borrowing (-) (capital account) FA365000905.A] /*Y*

Figure 5. The total net value of financial assets in units of GDP aggregated across all sectors of the economy, excluding equities, ownership of unincorporated businesses and monetary gold, (♦); The value of "Instrument discrepancies" between the value of assets and liabilities in units

of GDP, aggregated across all types of financial instruments (except for equities, ownership of unincorporated business and monetary gold) (□).

♦	{([*HN* total financial assets FL154090005.A]-[*HN* total liabilities FL154190005.A]) + ([*NFCB* total financial assets FL104090005.A]–[*NFCB* total liabilities FL104190005.A]) + ([*NFNCB* total financial assets FL114090005.A]-[*NFNCB* total liabilities FL114190005.A])+ ([*FB*; total financial assets FL794090005.A]– [*FB*; total liabilities FL794190005.A]) + ([*GnG* total financial assets FL364090005.A]–[*GnG* total liabilities FL364190005.A]) + ([*RW* total financial assets FL264090005.A]–[*RW* total liabilities FL264190005.A]) –*Eq*– [*HN* Proprietors' equity in noncorporate business LM152090205.A]–[*FdG* Monetary gold FL313011205.A]–[Monetary authority; monetary gold FL713011203.A]}/*Y*
□	{[*ID*; Treasury currency FL903012005.A]+[*ID*; net interbank transactions FL904010005.A]+[*ID*; checkable deposits and currency FL903020005.A]+[*ID*; federal funds and security repurchase agreements FL902050005.A]+[*ID*; trade receivables FL903070005.A]+[*ID*; taxes receivable FL903078005.A]+[*ID*; total (unidentified) miscellaneous assets FL903090005.A]}/*Y*

Figure 6. USA The ratio of total value of financial assets to GDP (▲);The ratio of total wealth to GDP (●);The ratio of total value of nonfinancial assets to GDP (○);The ratio of profits of financial business to GDP, right axis scale (+).

▲	{[*HN*; total financial assets FL154090005.A]+[*NFCB*; total financial assets FL104090005.A]+[*NFNCB*; total financial assets FL114090005.A]+ [*FB*; total financial assets FL794090005.A]+ [*GnG*; total financial assets FL364090005.A]+[*RW*; total financial assets FL264090005.A]}/*Y*
●	[All sectors; U.S. wealth FL892090005.A]/*Y*
○	{[*HN*; nonfinancial assets LM152010005.A]+[*NFCB*; nonfinancial assets LM102010005.A]+[*NFNCB*; nonfinancial assets LM112010005.A]+ [*FB*; nonfinancial assets (does not include land) LM792010095.A]+[*FdG*; nonfinancial assets (does not include land) LM312010095.A]+[*StG*, excluding employee retirement funds; nonfinancial assets (does not include land) LM212010095.A]}/*Y*
+	[*FB*; corporate profits before tax excluding IVA and CCAdj FA796060005.A]/*Y*

Figure 7. USA Return on equity for nonfinancial corporate business (Δ); Net capital investment changes/GDP (○); Growth rate of the real GDP (●).For a billing period *t*:

●	[*Y*(*t*)/*P*(*t*) – *Y*(*t*-1)/*P*(*t*-1)]/[*Y*(*t*-1)/*P*(*t*-1)]
○	{[*DB*; gross fixed investment and inventories FA825019905.A]- [*DB*; consumption of fixed capital FA826300003.A]}/*Y*
Δ	{[*NFCB*; corporate profits before tax excluding IVA and CCAdj FA106060005.A]+[*NFCB*; taxes on corporate income FA106231005.A]}/[*NFCB*; net worth FL102090005.A]

Figure F1 A share of total shareholder value owned directly by US households. Calculated as the ratio of the aggregate value of equities in the household balance sheet (assets) [HN; corporate equities; asset LM153064105.A] to the total shareholder value [All sectors; corporate equities; asset LM893064105.A].

Figure F2 Net issue of shares of nonfinancial (+) and financial (Δ) US corporations cumulative total; aggregated shareholder value (○) and own capital (●) of financial corporations; all in GDP units.

+	*NFCB*; $\Sigma(NI/Y)_{NFCB}(t)=\sum_{\tau=t_0}^{t} NI_{NFCB}(\tau)/Y(\tau)$; NI_{NFCB}=[*NFCB*; Net issues, corporate equities FA103164103.A]
Δ	*FB*; $\Sigma(NI/Y)_{FB}(t)=\sum_{\tau=t_0}^{t} NI_{FB}(\tau)/Y(\tau)$; NI_{FB}=[*FB*; Net issues, corporate equities FA793164105.A].
○	[*FB*; corporate equities; liability LM793164105.A]/Y
●	[*FB*; nonfinancial assets LM792010095.A]+[*FB*; total financial assets FL794090005.A]–[*FB*; total liabilities FL794190005.A]}/*Y*

Figure F3 The aggregate own capital of US nonfinancial corporations in GDP units.
[*NFCB*; net worth FL102090005.A]/*Y*

Figure F4 USA Difference between the total value of miscellaneous unidentified financial assets and the liabilities securing them (in units of GDP):
[*ID*; total (unidentified) miscellaneous assets FL903090005.A]/*Y*

Figure F5 Unsecured component of the shareholder value of nonfinancial US corporations (in units of GDP): {[*NFCB*; corporate equities; liability LM103164103.A] – [*NFCB*; net worth FL102090005.A]}/*Y*

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