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Towards Long Time Growth in Equilibrium: Game Approach

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Abstract: Different levels of development of individual countries cannot be simply explained with some of them enjoying better natural conditions. After all, so-called paradise islands haven't become leaders of growth, while a number of countries with difficult natural conditions (Scandinavian states, Japan) rank within strict leaders of the civilized world and there are hardly any signs to suggest they are about to lose their positions. This makes them models others are encouraged to follow. However, it occurs that the rate of success in implementation of selected solutions therefrom is rather mediocre. From historical perspective this situation is quite new. Assembly lines in Ford factories could have been effectively applied worldwide. Fast-food networks or shipping containers could have too. At present, however, in the 21st Century, equally spectacular cases seem hard to find. This may come as a surprise, considering that striking differences persist in the efficiency of individual countries' economies. In Europe, the distance between the North and the South remains undiminished; enormous chasm divides the United Mexican States from the United States of America. And all this happens in the world where – apart from few exceptions – almost all economies are open to well-proven solutions. Even if it's impossible to transform the whole thing over a short period, modeling upon best examples and practices, still it should be viable to achieve a gradual progress, step by step, through adaptation and transformation of individual elements of a given economy and emulating model solutions taken, for example, from neighbor countries. This way the development gap could be slowly reduced or at least stopped from increasing any further. And yet, this approach fails to yield significant effects. The reason, it seems, is in the growing integration and complexity of national manufacturing systems. It is always difficult to build something into a compact and complex system. This is especially evident with attempts to adapt foreign innovation-fostering systems. Usually, due to the lack of some elements, links, etc., the sub-system in question cannot achieve the efficacy of its model. Does it mean that such an implementation is entirely infeasible? No, it's not. While inflexible top-down adaptation occurs ineffective, it may be possible to start a successful process of self-adaptation that reaches deep within the entire system. It could be imagined like veins of the right kind of mold that penetrates cheese making it delicious. The point is this is a difficult sort of operation that requires a non-traditional (non-static) systemic approach.

Keywords: System, Balance, Economic Game

1. Introduction

To get satisfying position in the international competition is necessary to analyze the economic as living a system. Its elements and inside relations are still in process of changes and transformations. It means that all participants (enterprises, government etc.) should more focus on the own strategies then their structure and problems inside. As most important it seems to find appropriate relation among short, medium and long time strategies realized by the companies and some steering authorities. It isn't easy in the sake of different ability of particular units to realize all kinds of such strategies. For small enterprises, depended on current market, most important is the short time horizon of activity. Medium size and big companies, entangled in complex net of connection should pay more attention on multiannual cooperative agreements. The very big companies only are able to prepare and implement long time strategies. This is also the field of the government engagement. Author believes that the policy, understanding this roles division, is the key of stable

economic growth.

21st Century's Economic System

Systemic approach has presently become a canon of methodologies, in particular in social sciences. That economy is a system is beyond any doubt and to quote the fact is pure banality. What is quite significant and not entirely defined, instead, is the nature of such a system. In this respect the economy has undergone far-reaching evolution over time. Already in an ancient era the Mediterranean region was an area of relatively stable relations (cereals from Egypt, copper from Palestine and Arabia, iron from Iberia, and so on). Nowadays, however, the strength of economic relations is incomparably greater. Problems with lithium and rare-earth elements mining in China immediately translate into serious disturbances in manufacturing of electronics in the USA, Japan or Western Europe. Such an extent of integration entails quite a different leeway for individual elements of the economic system. It is much smaller, each time with a different environment, basically only specific for a given case. This makes a formidable challenge for implementation of individual solutions carried from one country to another. Searching for analogies, one is found in cultivation of ginseng which basically proves successful only in South Korea where decades were spent on studying soil, climate and microbiological conditions, requiring an expert research staff, equipped with very advanced research instruments. So far, the same effect has not been achieved elsewhere. Another example: French cognac seems much more a product of the French winemaking culture than it is of any specific recipe devised by any single manufacturer. Generations passed until all the right ingredients, blending and storing methods were developed and refined. Here, too, competitors from other countries can only claim modest success.

Considering all this, one may come up with the following:

Thesis 1. The growing economic integration of economic systems determines a situation where success in production or another business increasingly depend not solely on the producer, but also on their economic environment. Countries that are capable of offering a broader range of outsourcing, communication networks and research centers gain advantage over the rest.

This thesis is not all-encompassing. There are exceptions from it, stemming from objective reasons. Advantages achieved in some very narrow areas tend to not translate into a country's gaining comparative advantage over other countries. For example, Bolivia, a country rich in copper, tin and lead, ranks among the poorest countries in the world. The same can be said about key producers of cocoa – the Ivory Coast and Ghana. But then, the case of Botswana is completely different. This is another country rich in raw materials, but thanks to sound infrastructure and stable political system is has distinguished itself as Africa's fastest developing country. At present Botswana achieves the level of per capita GDP of USD 18,000 (2018) which is roughly similar to that of China or Mexico [1]

At present, it is the system in its entirety rather than individual elements that determine one country's advantages over other countries. In fact, this has been this way for a long time already. One example is in relationships between China and Japan in the 17th and early 18th Centuries. At that time China was the most developed region of the world. Its international exchange mainly consisted of trade with Japan. But it was also very peculiar, with China exporting many types of their products, and Japan – basically only supplying silver. Manufactured products from Japan were not competitive compared to those made by highly-skilled Chinese craftsmen. Anything made in Japan was easily matched or surpassed by products manufactured in China which made senseless to carry them over the sea.

Contemporary economic advantages in international relations no longer stem from any particular conditions or manufacturing skills in production of specific products. Instead, they stem from a system. Actually, it would be artificial to separate a single manufacturer: after all, they all operate within some specific transport and telecommunication networks. In their environment they have technicians, service providers, outsourcing, research and educational backing, power network, social services, and so on. Of course we can say similar products from different countries are better or less good, and certainly the credit largely goes to their manufacturer. However, in the remaining part this is an effect of efficiency of the entire system. And this, among other things, explains why cars made in Germany are better than similar models manufactured by Volkswagen subsidiary plants in Mexico or even in Spain.

Another attribute of a system is its decreasing predictability. This prompts us to dare and propose another thesis:

Thesis 2. An economic system becomes less and less predictable over time, which increases the significance of its flexibility. The ability of making rapid changes has presently become one of the most important and desirable elements of comparative advantage.

An example of a mistake resulting from poor predictions based upon hitherto-observable trends was East Germany's development of large scale production of mechanical calculating machines in 1960s. At that time most offices throughout the Eastern bloc countries boasted Ascota machines as symbols of modern technologies. This was how East German precision industry was meant to promote the country to a group of leaders of the third industrial revolution. A mechanical desktop calculator capable of all four arithmetic operations weighted around 20 kg and, due to many rotating cams and gears used, emitted noise at a level of *c*. 80 decibels. In fact, with some practice it occurred faster to make most such operations using an abacus, and as far as division involving floating point numbers is concerned – on a sheet of paper. The thing was that to hold to traditional methods was considered a symptom of backwardness. But then, just when the production of this machinery achieved its peak in terms of numbers and reliability, they occurred redundant overnight: the era of electronic calculators began.

Nowadays we probably know even less about changes that are going to be triggered by new technologies, social trends,

climate *etc*. over the next generation, or even several years ahead. Ten years ago the Arab Spring could spread so wide thanks to the Internet, and this completely surprised autocratic governments in Northern Africa, accustomed to strict control over traditional mass media and the society in general. In the military field it is a big dilemma today whether to develop new aircraft constructions controlled by human crews, considering how much progress is achieved by unmanned craft (like American "Predator" or X-47). Such a change toward automated combat machinery would completely overturn hitherto-existing programs of anti-aircraft warfare systems. Similar things may happen with office work. While the area of office buildings keeps growing around the world, it isn't certain whether they will remain in demand within perspective of less than one generation, in the context of development of telecommunication network (5G). It may soon become possible to perform almost all traditional office activities remotely from home, maintaining permanent communication within teams. It is going to be a great skill and at the same time an important factor of comparative advantage to make efficient use of redundant infrastructure, as we are witnessing nowadays with residential lofts being arranged in disused factory buildings.

Systems and sub-systems of contemporary economy become more and more complex, thus entailing problems with control over them. This leads us to proposing:

Thesis 3. It becomes increasingly difficult to control the economy or large portions of it, and practically impossible unless self-control takes place in its lower strata. Centralization, instead of consolidating the system, provokes its destruction.

Uncontrollability results from resistance of the system itself, as it is incapable of performing some of its functions, seemingly indispensable. A large and complex system requires outstanding skills from the body that controls it – and the greater the centralization, the greater the skills required. It seems apt here to mention the law of essential diversity. According to it, internal control mechanisms have to be at least as diversified as the environment in which they operate (i.e. the extent of the system diversity should correspond to the diversity of entries into the system [2]. This way the system is capable of overcoming difficulties generated in its environment. A system which fails to cope with the diversity of its environment loses its complexity and disappears [3, 4]). This law found its evidence in the breakdown of centralized socialist economies. These days we are probably witnessing another manifestation of it: in the form of correlation (at least in statistic terms) between an increasing centralism in today's Russia with decreasing efficiency and efficacy of its economy. Whereas in the years 2000-2008 the rate of economic growth in that country oscillated at 7% annually, in the years 2009-2017, following subsequent stages of consolidation of central authority, the growth rate declined to just 0.7% and no signs of improvement are to be seen so far [5]. Corruption increased, as well. In the global ranking in 2019 Russia was ranked 88th which was six places lower than one year before [6].

System diversity cannot be decreed. Worse still, it only develops in proportion to development of the economy, as witnessed in almost all aspects of life, from organization of air traffic, through a car combustion engine, or stock management in a supermarket. There is less and less events and processes that allow for direct control from the top, which means some mechanisms of self-regulation have to emerge.

If they emerge indeed (either spontaneously or generated by external forces) and will act very effectively, then it becomes natural to ask the question whether we really need the managing center at all? Catalonia, not only in its own opinion, is capable of self-governance. The same can be said of Scotland. In both cases it seems that central governments are unable to cope with specific problems, prerequisites, local environment. Similar phenomena occur in great industrial organizations. Could this herald the end of extensive structures, both political and economic, split up by their increasing inner diversity?

Practice suggest this isn't the right assessment. Huge corporations fare rather well. China or the USA aren't threatened with splitting up, either. However, this does not imply that the range of the law of diversities of the controlling and controlled systems is restricted. Truth is, whereas a growth in diversities does stimulate the tendency to disintegrate the system, at the same time another force appears, which holds it together. This happens in the form of phenomena that gravitate toward a type of self-regulation which evolves around processes that are only viable, only sustainable by joint effort. We call such systems integration attractors. Hence, here we come up with:

Thesis 4. Big systems persist thanks to strong integration attractors. In the lack of them, and only relying upon the formal authority of the controlling center, they lose their balance and collapse.

History seems to lend firm evidence of the existence of such attractors. For China, this role was played by ideographic writing system which enabled communication despite a conglomerate of languages over vast territories. On the other hand, Spanish and British empires, relying on the military power, both declined due to centrifugal forces. For industrial organizations, research activities and marketing act as integration attractors. Both sectors are very costly, requiring lengthy, continuous work over many years and, most of all, substantial capital investments. A dozen or more years pass between development and actual application of a new, original drug. To develop an apparently uncomplicated component of a passenger car – the platform – in reality is such a complex and demanding problem that many platforms are developed through several manufacturers joining their forces, even if they are fierce competitors in any other area. Nowadays, for example, a common platform is used in VW Sharan, Seat Alhambra and Ford Galaxy [7]. Cooperation in space technologies is another well-known phenomenon. For example, for over a dozen years Russian RD-180 rocket engines have given motion to American Atlas V rockets) [8].

The Soviet empire that split up after 70 years of existence,

was a meaningful case of ineptitude of a vast, highly centralized system. The country was following the model of central planning with much consistence. Reckoning, quite right, that a healthy unity consists of more than just healthy elements, it endeavored to develop a harmonized system through a uniform plan for the entire economy. Everything related with its construction and control was done from a single place: Moscow-based authority center. The extent of centralization was extremely high, although concealed under superficial division into union republics and autonomous republics. In mid-1980s there were around 80 so-called union ministries, plus over a dozen ministers' committees. Despite all that, the economy was slipping away from the hands of the controlling center, thus leading to constant reorganization that failed to bring any positive effect either [9]

At present, Russia seems to carry on the process on a slightly lower but still excessive level. The economic authority rests in the hands of oligarchs who subordinate vast areas of economy to themselves, basically by force. As a point of fact, it is not possible to operate in that country beyond the so-called "*krysha*" (roof) *i.e.* a web of relations that protects, more or less effectively, from ruthless acts of competitors. In that case it is the sense of safety that acts as integrating factor which, unfortunately, is much less productive than cooperation in the R&D area or in marketing projects.

2. The Economy as Game

At present it seems indisputable that economy is a dynamic system – but there is much dispute about how this dynamics manifests itself.

One relatively common mistake is to reckon a system dynamic whereas in fact it is simply changing. In some cases it keeps changing by evolution – an example being the B-52 bomber: in production for nearly 70 years, it is under continuous development and believed to be an aircraft bound to remain in service for two decades to come. On the surface it is an old construction and anybody can easily recognize the aircraft looking at photographs. Nonetheless, it certainly has changed: it evolved slowly, step by step, almost imperceptibly, but over time its performance and combat potential have become significantly different than when first deliveries had begun in early 1950s.

Unfortunately, the same cannot be said about some other systems, for example the landscape of Borneo island. According to estimations of World Wildlife Fund, by 1980s tropical forest there survived in natural state in around three quarters. At present, this is just c. ¼ of the island [10]. Even more dramatic changes have taken place over that period in some Asian economies (South Korea, China). Contemporary Singapore seems an altogether different world compared to how it had been five decades ago. Such examples can easily be quoted in scores, not only as regards geographical regions, but also in terms of manufacturing and distribution, concerning telecommunications systems, computers, media, etc. They all reveal that dynamic systems are not only about diligent honing – some of them are about complete change, a transformation from chrysalis to a butterfly.

Structural transformations aside, in this context it is more significant to distinguish between dynamic and static systems. The former ones are represented by technological systems in which holistic changes are made, consisting in an exchange of individual elements and links. Both before and after the change, their elements operate according to a pre-determined algorithm. Throughout the entire restructuring process, elements of the system remain passive. They do not reveal any activity on their own. They do not involve in actions in pursuit of their interest because they don't have one. In economy and in nature, instead, this is totally different. Trees actively and independently strive for light, enterprises endeavor to find methods to increase their profits, people seek for better comfort and increased consumption. Therefore, technological systems belong to a completely different category. They remain stable – at least over short periods. Natural systems and the economy both undergo a process of perpetual change. In seeking to ensure as much advantage to themselves as possible, their elements enter in coalitions and attempt changes they devise single-handedly. None of this is done (so far, at least) by elements of technological systems. Integrated circuits, computer network terminals or pipes in a waterworks system do not express the intentions of their own.

Considering that an economic system is actually a self-controlling arrangement, it is gaming model that seems to provide a good plane for analysis. To apply this, let's define some relevant notions:

1. Game. The place where various participants attempt to acquire some specific benefit, defined as payoff function.
2. Strategy. A sequence of choices of action variants made within so-called game knots. These are moments when provisional opportunities appear to approach to a payoff and one of them has to be chosen.
3. Balance. The game is in balance where none of the players sees any reason to change their strategies.
4. Payoff function. Attribution of a certain value of award or penalty to each completed strategy (from: Owen, 2013, p. 2–5).

In economy there is nothing constant; the games goes on continuously. In the game, conscious elements do their best to secure the highest values of payoff function possible. They do that by implementing appropriately chosen strategies. As their environment evolves, they make choices about where and how subsequent steps should be made in pursuit of the objective set. Therefore, what we have to deal with is something radically different than in technological systems. The differences are especially evident in the balancing process. In technological systems the balance is achieved through harmonization of states of particular elements. In natural systems, instead, this happens through self-adaptation of strategies. For the former ones, a bridge structure may be quoted as an example of balancing. In spite of action of a variety of forces (including changing load, wind, sometimes, and to a certain extent, even earthquakes) such a construction

is not subject to dangerous deformations. In the world of nature, an example may be sought in prairies of Australia. Despite permanent fires, the ecosystem remains unaffected. Moreover, seeds of some plants only open up where there is fire nearby. This way they gain access to precious mineral ingredients on the soil reduced to ashes, without having to fight with their competitors. As a negative example of technological system, St. Peter's cathedral in Beauvais (France) may be proposed. In the 13th Century it collapsed twice. Third time, in the 17th Century, its tower fell down. In all these cases the reason was the structure, too fragile to balance heavy masses of stone [12]. A collapse of a social system, instead, takes place mostly in the situation of extremely unequal payoff function for different social strata. In the second half of the 18th Century in France, with famine plaguing the country, the aristocracy was luxuriating in outrageous excess and could always count on their debts being bailed out by the king. Nobody cared to lend a hand to the starving. That had to result in revolution, and, by the way, it wasn't the first time things went this way. Nowadays, increasing income disparities also become a threat to the stability of the system. Hired workers keep working more and more effectively, but the benefit goes to their superiors and shareholders of companies.

In technology, the conditions to ensure the state of balance can be calculated. In economy they can't – at best it may be possible to define an arrangement in which the likelihood of success is high. A technological system may be designed as inherently balanced and it is going to remain balanced for a long time, without any further input from the outside. In the case of a social and economic system, the same may only be possible where it is reckoned satisfactory by most players – in that case it may be stable or even resilient to changes. However, its resilience may also relate to changes that, at least theoretically, would have been beneficial to the system. As one example of failure (hopefully, not complete yet) of such a potentially advantageous change, is the construction of schools and hospitals in Afghanistan. Those built beyond the areas under strict military control are devastated as products of the Satan's slaves. Seen from the game perspective, such values of the payoff function are unacceptable in that country's society, as are strategies undertaken there and aiming at their acceptance.

On the other hand, a positive example is found in the so-called green revolution. New croppers of wheat and corn, introduced in the 3rd quarter of the 20th Century thanks to the UN agendas, contributed to deliver substantial parts of India, today's Bangladesh and several other countries in Africa and South America, from famine. This was something people wanted and what opened them up to novelties of agrarian technology in general, *i.e.* to the area that in those regions had hardly undergone any evolution for thousands of years.

In both cases we had to deal with temporary disruption of balance through the necessity to change the way fields were cultivated. However, thanks to social acceptance of the green revolution, the balance was restored, and it did on a superior level of meeting the demand. In Afghanistan, instead, no strategies were undertaken to develop a new system of education and health care. Rather than that, local societies reverted to obsolete, medieval practices.

Balance is a natural state of the game, best represented by well-balanced natural ecosystems. Any social system undergoes a continuous and cyclical process of disrupting and restoring the balance – and this occurs with different strategies and different values of the payoff function. Historically, they become higher and higher, but of course the process is not linear; instead, it meanders considerably. What is important is that those involved in the process are motivated with different strengths to participate. There are enough many societies living in stagnation and very reluctant to change. Such attitudes were faced for years and years by innovators who propagated progress in agrarian technologies, or by pioneers of new technologies in industry.

Games do exist in a social and economic system and exist they should. The problem is: which ones and where. In centrally planned systems they mostly took place within administrative arrangements (better allocations, smarter plans). This way it was possible to obtain higher values of the payoff function (advances for managing teams, assignments of holiday packages or coupons for goods in deficit for the employees). Solutions aiming at better work effectiveness were rather secondary here, in the sense they were only approved where they contributed to the achievement of planned targets. Actually, many stories of unimplemented Polish inventions are rooted in that period – those whose implementation would not have fit within the plans, or would have obstructed their execution. One example was the world's earliest, Polish 8-bit computer K-202 (1970s) (13), the production of which could not have been launched because all production capacity was being consumed by manufacturing of obsolete and heavy Soviet-engineered computers. Similar was the case of Europe's first Polish compact (one-volume body) car called Beskid [14]. Its production never began as it would have interfered with already tooled production of licensed Fiat cars.

Economy is an arrangement of games played by its participants. This is not a relevant place to involve in any profound analysis thereof, but it seems apt to mention there are systems that feature particular intensification of synergic effects – like innovative economies. At another end, there are games prevailed by destructive effects, like oligarchic systems fighting for control of resources rather than competing for their efficient use. These are the plagues of emerging markets – systems where the important part is not what kind of goods you generated: instead, the key thing is with which oligarch (boss) you managed to negotiate distribution, supplies and, in many cases, so-called protection.

3. Key Players and Their Strategies

For social development one crucial issue is where and how games are played. The point is, for example, for political games to unfold in bodies of authorities and in the media,

rather than in the economy. And the other way round, where economic games are contested in the structures of power, the economy becomes incapable of using the potential of its inherent reserves of efficiency. Why would it, after all, if such efforts would all the same remain unrelated with the payoff function?

However, the efficiency of the economy as the whole, seen as the system of games, does not depend on whether the objectives of participants and the tools of their achievement have economic nature. Even if it happens they are, still the productiveness of economy may occur insufficient. Some uncoherent strategic arrangement may exist within the economy itself. In order to explain how it emerges, one has to bring some order and classification to strategies.

Starting with divergent strategies, the most spectacular area where they occur is the link between the field of scientific research and manufacturing. It happens that laboratories, universities and institutes compete for grants and implement ambitious programs that operate quite irrelevant of the industry or the needs of the society. In Poland, for example, in the first years of this century, significant progress was made in technology of generation of graphene. In 2011 a method was developed to produce graphene on an industrial scale, but still its production never makes it beyond the laboratory. The reason is the lack of orders and commercial applications. As a result, in 2017 Nano Carbon company, established to develop and implement production of this advanced material, was put on sale [15].

Now, such a fact could be used to put a finger on clumsiness in absorption of new solutions by Polish economy. Perhaps it's true, but it should be observed that at present graphene is only used in manufacturing of integrated circuits that are not in production in Poland. Neither they are in Europe. That's why there was nobody whose strategy would be convergent with the strategy of inventors of Polish graphene. Big global manufacturers had their own laboratories which certainly made efforts to ensure their products would find demand and application.

As we consider convergent strategies within a system, they may be divided into cooperating and competitive. Both types are needed: which are needed when and where, depends on the sector of the economy. In some sectors the former ones are essential, in others only the latter are necessary. It seems that the criterion of usefulness of both above-mentioned strategies can be defined by specifying temporal horizon of these strategies. The shorter it is, the larger the significance of competitive strategies (i.e. competitive market). As the time horizon extends, cooperation becomes of crucial importance, for example in the form of cooperation of different companies in developing solutions to some fundamental technological problems [16].

However, as its horizon extends, the nature of a strategy is not changing seamlessly. Accordingly, they should be divided into at least three groups, mainly due to a different role played therein by the market. But first of all, let's name the sectors of economy to which such strategies relate:

1. Short-term strategies, in which no significant role is played by predictions of changes in their environment. For example, in production of gelatin it is obvious from which ingredients it is made and to which purposes it will be used. This generally relates to areas featuring short periods between the idea to manufacturing and application. After all, little research work or retooling of production line is needed to change to a new cut of a jacket.
2. Mid-term strategies. These relate to projects whose time horizons extend over at least a few years, including investment projects or restructuring of production. In that case the temporal horizon extends until completion of key investments or production restructuring programs. Here it becomes important to use the power of imagination in an attempt to foresee how the market will evolve in the future, sometimes even bringing changes that may seem unreasonable at the present moment (*e.g*. withdrawing from plastic packaging). Such strategies as an important element include taking into account the risk of changes in their environment. They need forecasting and development of precaution procedures (so-called B plans, testing resilience to potential changes, stress tests, *etc*.).
3. Long-term strategies, whose effects manifest themselves after periods longer than standard forecasting horizons. Over long periods, a number of possible scenarios is usually so large that it would be tricky to rely on just one of them. Such strategies can only be applied where changes are (or should be) relatively slow-paced: in developing networks of transport routes, systems of education, basic research – and they may be followed by actors having a sense of mission. In this context, the present condition of the market is of little relevance; it is more pertinent to cater for natural needs of the society, such as the freedom of travel, health, or safety.

Strategies followed by actors of the economy should aim at balance, that is – as already mentioned – to a condition where none of those involved have reasons to change their behaviors. An example of that is the functioning of a market price. Both parties of a transaction accept it. It doesn't mean they are necessarily satisfied with it, but they know that under the given conditions it would be unlikely to change it. If a buyer insists to have the price reduced, the seller will sell the goods elsewhere, and in the same way the seller's stubborn policy of overpricing will only result in his stock filling the warehouse unsold.

It is market that has been regarded the fundamental mechanism of balancing the strategies. However, the market is not operating in a uniform way in this process. As far as short-term strategies are involved, the market dominates in a very simple sense. Merchants trading in textiles or vegetables source their supplies in wholesale markets, one day buying from these and another day from other sellers. Manufacturers of machinery, on the other hand, have to operate on the basis of negotiated, multiannual contracts, because the products

they make cannot be assembled from what is randomly available at any given moment. Or, to be more specific – this cannot be done if one has ambition to maintain high quality of the product. The role of the market is most problematic in ensuring the harmony of long-term strategies, one example being adaptation of educational curricula to the needs of ever-changing economy.

Long-term strategies are and indeed should be the domain of the state. The market has very little regulating power here. If we consider development of railway networks, or institutions dealing with the crucial problems of physics (quarks, Higgs boson), it would be quite hard to find investors eager to finance projects in these areas among the private sector. The problem is too lengthy waiting times and uncertainty of return.

Private sponsors of long-term programs are rare because it is rather unlikely to gather as many as five fundamental things that are essential in this context. Firstly, the investor's own life expectancy has to be long enough so they can be reasonably optimistic about seeing the final effects of the venture. Secondly, the achievement of current returns has to be reckoned secondary, because the funds are involved for many years. Thirdly, the investors have to have substantial capital so that in case of the project failure they can avoid total collapse of their consortium and social degradation of those involved. Fourthly, the aim of the project has to be socially acceptable, because otherwise its supporters would experience pressures that, extended over many years, would be hardly tolerable. Fifthly, extraordinary organizational and personal talents have to be present, because to implement this type of programs a sound and solid team is essential, capable of working for years in coordination and with the sense of mission and personal self-fulfillment.

One spectacular exception, *i.e*. a rare example of person who combines all these properties, is Elon Musk. He is relatively young. The means in his possession enable him to survive more than one crisis and repeated shifts from one activity profile to another. His passion impresses entire societies and has attracted a group of equally passionate people to put their careers and life perspectives at stake and involve in the implementation of such hyper ambitious projects as the Space X program. Such cases, however, are very few.

This sort of people undeniably add colors to technological progress and especially to grand programs that mark its milestones. And yet, it's not them we should bet on. The great space exploration program of the 2nd half of the 20th Century that never stops to fascinate, obviously was not initiated by market, nor was it funded by private sector. Space X is an absolute exception and one can hardly expect many followers in this respect. There are probably never going to be enough many multi-billionaires in pursuit of extensive and reasonable missions to push the societies and civilization forward. What we will experience, at best, is them funding libraries, university faculties, sponsoring environment protection and so on. It would be naïve, however, to expect much more.

At present, witnessing massive criticism of the Washington Consensus, we might assume that the market potential for balancing and developing the economy is limited. The state is indispensable, as manifested by significant examples, including NASA programs thanks to which there are thousands of satellites on the orbit. Without them, one could hardly imagine contemporary telecommunication, navigation or even crop control. Let us not forget they were carried there by rockets developed and manufactured under state-funded space programs.

Any healthy economy needs the market, the economic activity of the state, and it also needs efforts from social institutions (chambers of commerce, non-profit foundations, producer associations, trade unions, *etc*.) Together, this combines to create a dynamic and complex system which not only evolves as the whole structure, but also enables its individual elements to change. This is how well-developed economies operate. Many less-developed ones are seemingly similar, but certainly lack something. So how has it happened that some economies manage to achieve solid balance and their players rank among the leaders of progress, whereas the rest is only struggling to catch up?

The key to what the individual entities within an economic system are supposed to do is determined by temporal horizon in which they are able to implement rational strategies. No greengrocer's shop enters into multiannual contracts with growers of lettuce or chicory. They source their supplies in wholesale markets. The latter ones are quite volatile and hardly predictable, but nonetheless it is always possible for a shop to come up with an attractive offer from day to day. The same cannot be achieved with investment projects on a larger scale. Here, contractors and suppliers – of machinery, construction elements, recruitment agencies – have to be selected years in advance, with carefully negotiated contracts. Such periods of pre-coordination have to be even longer in the case of vast infrastructural projects, such as airports, sea ports, new universities. Anything requiring current adaptation should be managed by entities capable of considerable flexibility. Even mid-term projects cannot only rely on what happens today – instead, they need planning for several years ahead. Expected effects of each of several stages of the implemented strategy have to be specified, as well.

The state involvement in the economy has been the most debatable factor. Where market operates effectively, it is obviously wrong to replace it with administrative tools. Therefore:

1. In the area of short-term strategies, the economic role of the state should be basically marginal. In trade, or in production of textiles the state should have little or nothing to say, except for monitoring health hazards or safety of circulation. Generally, though, this is the domain where competitive strategies should prevail.
2. Then we have the area of mid-term strategies. Here, seeking and entering into relationships, making cooperation contracts or joint projects is done most successfully via horizontal contacts. Parties involved know best how to achieve income. However, in this

group the phenomenon of risk appears, and small and medium-sized enterprises are not able to secure themselves against it. In effect, they need support from state institutions, such as Eximbanks, foreign promotion funds, subsidies to credits for innovations, *etc*. Cooperative strategies become necessary here, mostly of vertical type (state-enterprise, science-manufacturing).

3. In the area of long-term strategies, the role of state is crucial. At the time of a new revolution in science and technology, temporal horizon of corporate activities is just few years ahead. It is only so much time that key managers are hired for and this is also time perspective in which shareholders and other stakeholders operate. Nobody would accept responsibility for effects of, for example, work on nuclear synthesis, quantum computers, artificial photosynthesis or profits to be made on potential TGV type of trains communicating Western with Eastern Europe, or education of experts in quantum facts. And still, these are among the very fundaments of progress. To work on them, to lay them down is usually very expensive and exposed to serious risk of failure. Joining forces, implementing cooperative strategies along the state-scientific research line, collaboration among academic centers, are all vital in this context.

Every strategy may occur mistaken, but then again, not every sound strategy ensures positive effects. And then, the character of a strategy has to correspond to the nature of whoever implements it. It has to be properly motivating. Long-term strategies may be followed with enough involvement only if their proponents and executors reckon them valid and sensible throughout, and, even more importantly, if they reckon they will likely become their beneficiaries in the end. The problem has been known for years. For example, lease-holders avoid significant investments, because they never know for how long (or whether at all) they would enjoy their outcomes. Kolkhoz farming cooperatives were notorious models of inefficiency, but in Russia and Ukraine they still persist. Of course they should be replaced with private farms, but in the countries hardly known for respecting private property, farmers interested don't abound. In both countries it has been years since real private circulation of land is repeatedly announced to start very soon, but still it doesn't happen.

Private sector very rarely invests in infrastructural enterprises (roads, railway) because any rate of return is only likely to appear after many years. Present managers are not going to last that long, and then, they are rewarded for the effects they achieve. That's how we come at quite natural division into countries in which specific types of strategies prevail, and thereby place them on various levels of development. Let us distinguish three such groups:

A. Countries on a low level of development rely upon short-term business strategies. As a result, it is trade that dominates in generating their GDP, along with agricultural production not requiring complex knowledge (basic food products – without more refined ones like wine or flowers). Where such a country is in possession of mineral raw materials, they are usually extracted only with involvement of foreign capital. Such countries' comparative advantages solely depend on natural conditions. Enterprises use generic technologies, not aspiring to beat the competition with any new, unique solutions (*e.g*. producers of bicycles, porcelain, textiles, *etc*.).

B. In countries on middle level of development efficient mid-term strategies are applied, allowing their entry to an international market of processed goods. The leading role is played by manufacturers of products in sectors where new solutions account for the key asset (means of transport, telecommunications, computers and innovative software). This requires using the achievements of science (patents, licenses, know how) developed in areas where the system has the abilities to carry out long-term tasks (brilliant scientific staff, well-equipped research centers). For efficient operation of the economy at that stage, cooperation with developed countries is necessary. Natural comparative advantages of this group of countries mainly include cheap but well-skilled labor force. There are other important advantages as well, but they cannot be regarded natural – such as creation of administrative and business environment friendly to foreign capital.

C. Highly-developed countries implement long-term strategies. In private sector this means the ability to conduct and then to apply scientific research. In public sector this means construction of communication and transport infrastructure, and social infrastructure (education, stable and reliable social order), environment protection and sustainable development (thanks to research establishments). Activity of the state is essential and determinant in this context. Through public procurement, subventions and subsidies stimulate the implementation of projects which, from purely commercial point of view, would be seen as yielding effects too distant in time (education) or involving an excessive risk of failure (research activities).

4. Conclusion

Comparative advantages of individual counties are not really natural. Instead, they are determined by the quality of a country's social and economic system. The countries that enjoy advantage over others have attained that because they have featured a better composition of strategies followed by their business actors. The supreme position is achieved by the economies that manage to develop a relatively comprehensive and balanced system of strategies. This is a difficult thing to do. In the process of transforming from poorly to highly developed economy, this requires a constant modification of programs implemented. In the beginning the key thing is to take care for free market and smooth operation of businesses that follow short-term strategies. To that end, many obstacles have to be eliminated (nonploe, racketeering, *etc*.). In the next stage, room has to be made for mid-term strategies, which already requires an extent of stabilization in

social environment and mainly in terms of state. Then, an advance to a group of economic leaders may follow, but only with an arrangement of harmonized short-, mid- and long-term strategies, with significant state involvement in long-wave economic processes.

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