

Istanbul, Turkey · 2024 September 04

IIPPE 2024 • China Working Group Workshop

“The Rise of China and Its Implications to the World”

China Confronting the Challenge of the “New Productive Forces”

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The Significance of Developing the “New Productive Forces”

- CPC Secretary General Xi Jinping, in a Politburo meeting on 31 January 2024, stated that “the development of the New Productive Forces necessitates comprehensively deepening reforms for the formation of the appropriate new types of productive relations.”
- Earlier on 11-12 December 2023, the Central Economic Work Convention defined the New Productive Forces (NPF) in the following way: “need industrial innovations driven by science and technology innovations; in particular, need to develop new industries, new models, and new dynamism on the basis of subversive and frontier technologies.”

Succinctly, the NPF point to the on-going new round of technological-industrial revolution on the world scale.

- The development of the NPF necessarily confronts systematic challenges, as it requires enormous investment whilst facing enormous risk and uncertainty.

The Central Economic Work Convention pointed to “enhancing the xinxing juguo tizhi (the new system of nationwide mobilization)” as the means for coping with the challenges.

Because of the emphasis on the principle of independence and self-reliance, it does require the synergic efforts of the state, business, and the scientific establishments.

- Why should China devote maximum efforts and resources to the development of the NPF, whilst facing enormous risk and uncertainty? It is compelled to do so given the existing environment.

At one level, China faces the sanction and suppression by the advanced capitalist countries. This is not just a matter of increasing difficulties for importing technology. Its own industrial and economic security is under threats.

At another level, the development of the NPF involves “subversive and frontier technologies”. This implies that China and the advanced capitalist countries are almost in close positions on the starting line of the new technological-industrial revolution. There is the possibility, and opportunity, of “overtaking on a curved road”.

- Of more immediate concern, China has been experiencing a persistent trend of slowdown in economic growth for more than 10 years.

Does this reflect the “Middle-Income Trap”, “the exhaustion of the advantages of backwardness”, or anything else? It seems clear that the previously-prevailing potential for technological progress and productivity growth has been diminishing.

- The sustained rapid economic growth in the preceding three decades depended much on assimilating and improving upon the technologies imported from the advanced countries. This was a rare experience of success on the world scene.

Yet, precisely because of the past success, China has now become close to the world technological frontiers. It can no longer replicate the past success.

That points to the imperative and urgency for developing the NPF.

The Economic Characteristics of the New Technological-Industrial Revolution

- Conceptually, it can be said that the development of the NPF signifies the completion of a process of transition - the transition from the steel-and-electricity technological paradigm to that of information-and-AI.
- The central characteristics of the steel-and-electricity paradigm: mass production based on dedicated equipment and standardized components, for the pursuit of increasingly precise production techniques and processes.

This paradigm was discernibly the main source of productivity improvement in world industry in the 20th century. It was closely related to the Golden Age of Capitalism.

Since the mid-1970s, the new paradigm of microelectronic technology has progressively shown out its potential to serve as the main dynamism of world economic development.

- Microelectronic technology enables the deepening of precise production and speedy transmission, while the related technology of big data analysis enables information collection and processing and therefore intelligent simulation.
- The permeation of microelectronic technology through the economy started with deepening precise production, and then moved on to promote flexible production (moving from single-product to multi-product mass production).

Microelectronic transformation of production techniques and processes took the form of the development from computer numerical-controlled machine tools to flexible manufacturing systems, as well as the widespread application of computer-aided design and manufacturing.

- Big data analysis pushes to the extreme of the application of microelectronic technology. It enables the accurate co-ordination between the structures of supply and market demand (as well as social needs), the management of highly complex and large-scale logistics, and economizing transaction costs from the micro to the macro level.◦

This enables the maximization of the economies of scale and scope.

The Technological-Industrial Revolution and “Creative Destruction”

- Schumpeter’s theory of “creative destruction” emphasizes that such technological innovations are typically discontinuous, fundamental, and systematic in nature.

Hence, the innovations are bound to reshape the economic landscape - the innovating enterprises killing off their competitors, the innovating industries replace existing industries, and the innovating nations catching up with the existing powers..

- In line with this theory, technological innovations can be classified under four categories:
 - (1) Incremental innovations: improvements over certain existing products or processes;
 - (2) Fundamental innovations: leading to discontinuous changes in industrial structures;
 - (3) Systematic innovations: leading to the formation of clusters of related industries;
 - (4) Innovations in the techno-economic paradigm: simultaneous restructuring of industries and economic organizations associated with technological changes.

It is posited that the last three types of innovation entail enormous uncertainties. Their discoveries and utilizations, require collective learning and co-operation.

A Taxonomy of Techno-Economic Paradigms

Industrial revolution	Technological revolution	Core inputs	Carrier sectors	Transportation & communication	Common appellations	Core regions
1 st industrial revolution	1 st technological revolution	Iron, cotton	Textile	Canals, highways	Industrial revolution	Britain
	2 nd technological revolution	Iron, coal	Steam engines	Railways, telegraph, steam engine ships	The era of steam engines & railways	Britain, spreading to West Europe & North America
2 nd industrial revolution	3 rd technological revolution	Steel, electricity	Iron & steel	Steel tracks, steel-made ships	Heavy & chemical industries era	USA & Germany catching up with Britain
	4 th technological revolution	Petroleum & natural gas synthetic materials	Mass produced vehicles	Super-highways, airports, wireless communication	The era of mass production	USA, spreading to Europe
3 rd industrial revolution	5 th technological revolution	Chips, information	Micro processors	Internet	Information & remote communication era	USA, spreading to Europe & Asia
	6 th technological revolution	Data, renewable energy, nano technology	AI & big data	Wireless networks, cloud networks, smart grid	The era of intelligence	USA, Europe & Asia

Sources: Peng Gang and Huang Weiping (2022) *Development Economics: A Textbook* (Beijing, Renmin University Press), adapted from the work of Christopher Freeman et al.

- The National System of Innovation: a networked system of interaction between the creation, storage, and transfer of knowledge, techniques, and new products, and is comprised of major agents of technological development and diffusion including individuals, business firms, research institutes, and relevant government bodies.

The effectiveness and efficiency of the system depend on the appropriate match, or otherwise, between the attributes and directions of technological development and the division of labour and co-operation among these active agents.

- The peculiarity of late development: the co-existence of
 - (1) the advantages of backwardness (including the possibility of technology imports and the avoidance of risk and uncertainty of developing frontier technologies); and
 - (2) the disadvantages of technological dependence and the danger of being left behind in technological development.

The Techno-Economic Paradigm of Fordism

- Central to Fordism is mass production. It emerged in the US in the first half of the 20th century, progressively outcompeting European craft production to become the mainstream of the world.

Discernibly, Fordism can be judged as the main source of productivity growth in the world economy in the main part of the century, particularly in connection with the Golden Age of Capitalism. It still maintains a strong dynamism nowadays, although beginning to exhibit traces of decline ever since the mid-1970s.

- In the technical sense, the foundation of Fordism is the steel-and-electricity paradigm. It is mass production employing dedicated equipment and standardized components and pursuing increasingly precise production techniques and processes.

The application of this paradigm follows the principle of the detailed division of labour. Not only is there the separation of conception and execution, but also the entire production process being divided into a wide range of operations - for the sake of economies of scale.

- The different links of the detailed division of labour need to be integrated for completing the production process. This necessitates the formation of Scientific Management (“Taylorism”), rigorous planning, and power-hierarchical systems.
- Connected to mass production is the existence and functioning of big business. Put another way, large-scale fixed investment needs a close relationship between finance and industry. It also tends to result in the separation of ownership and control in the corporations.
- Big business tends to result in monopolistic or oligopolistic market structures, while large-scale fixed investment logically requires such structures - because plannability requires a stable demand environment.

Meanwhile, mass production requires the existence of mass consumption as the source of demand. Yet, big business tends to have asymmetric market power vis-a-vis labour, especially if labour undergoes de-skilling in the context of Fordism.

Hence the need of big unions to act as the collective voice of labour.

Also the need of big government in the form of the welfare state to provide collective consumption, in addition to government bodies or state-owned enterprises providing infrastructure and promoting basic scientific research.

- A stable model of economic development is typically composed of the appropriate match between the production technology and organization (the “regime of accumulation”), on one side, and the institutional arrangements for economic and social reproduction (the “mode of regulation”), on the other side.

Fordism, for example, is composed of a regime of accumulation that is based on mass production and a mode of regulation that is based on mass consumption. Consider what could happen should the two sides are not in an appropriate match:

(1) In the circumstance where wage growth lags behind labour productivity growth, because the marginal propensity to consume out of wages tends to be higher than that of profits, the result could be underconsumption - i.e., insufficient aggregate demand, leading to capital unwilling to invest, therefore economic growth unsustainable.

(2) In the circumstance where wage growth exceeds labour productivity growth, there is the likelihood of wages squeezing profits - resulting in profitability decline, therefore economic growth unsustainable.

- The history of capitalism has exhibited a phenomenon of long cycles. Each cycle normally is composed of a phase of expansion in production followed by another phase of speculative-financial expansion. These two phases are normally associated with the rise and fall of a techno-economic paradigm, respectively.

In the post-WWII epoch, the Golden Age of Capitalism and its transition to neoliberal globalization can be seen in this light.

Insofar as this conception contains sufficient elements of truth, we might be on the eve of a new cycle associated with the development of a techno-economic paradigm dubbed the NPF by China.

China Confronting the Challenge of the NPF

- First consider the market. Theoretically, in the context where economies of scale and scope are the main driving forces of productivity growth, the concentration and centralization of capital - and hence monopolization - are the logical outcome. The antitheses of Schumpeter versus Arrow become particularly important.

Schumpeter's theory focuses on the consideration of capability. Its contention is that monopoly has the advantage of defending the long-term investment of capital against risk and uncertainty, and hence is conducive to technological innovations.

Arrow's theory highlights issues of incentive. Its contention is that monopolistic firms tend to focus on maintaining their market power and extracting monopolistic rents, and hence their reluctance to invest in innovation.

Which of the two theses has more truth? Can they be reasonably synthesized?

- Then consider the state. Regarding the regime of accumulation, state intervention has both advantages and disadvantages for the development of the NPF.

Advantages: basic research in science and technology and investment in infrastructure, which, indispensable for a technological revolution, does not normally have the attribute of quick profit returns and therefore need state intervention to materialize.

Disadvantages: the state, after all, is not an immediate agent in the economic activities associated with learning-by-doing and learning-by-using - yet such learning effects are likely a main driving force behind the technological revolution of microelectronics and big data.

How should the boundary and actual form of state intervention be defined, in a way that is reasonable for the development of the NPF?

- Regarding the mode of regulation, the state has multiple roles to play.

In the face of the market power of capital, the protection of labour interests and the support for mass consumption require the state and the society to act as countervailing force against capital.

In the face of insufficient capability or incentive of capital to invest in technological revolution, there requires state inducements and supports.

Furthermore, in the face of capital turning speculative and parasitic, there requires the state and the society to impose reasonable restrictions and responsibilities.

- Promoting the development of the NPF is part of the broader orientation of the state. Of equal importance is the consideration of social development, national security, etc.

Ultimately, China's state and society aim to pursue socialism-oriented modernization. In the actual process of the development of the NPF, there are the fundamental tasks of exploring how to overcome the obstacles erected by capitalism in the neoliberal era and how to transcend the experiences of capitalism in the Golden Age.