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**Development Orders and Disorders: Real Competition in Complex
Global Capitalist System, China's Ambiguous Case, and the Need for
Democratic Socialism in the 21st Century**

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Abstract

The main purpose of this paper is to locate the so-called developing economies (DEs) analytically within the complex dynamics of the global capitalist order(GCO). Using the ideas of disorder at the micro level and the emergence of order at the macro level out of this disorder, the capitalist order/disorder dynamics in the developing economies is explored theoretically and empirically. The classical idea of real competition can be used to explore how a crisis-ridden dynamics of uneven development emerges particularly for the DEs as part of the GCO dynamics. Some limits of policies and of the so-called developmental state capacities can be identified through this analysis.

A related purpose of this paper is to explore the possibilities of industrialization and development with equity in the 21st century with an emphasis on rapidly growing developing economies in the global system such as the BRICS . The formal nonlinear model presented in the appendix may be seen as an initial step to put the analysis within a complex economic systems framework. Real competition and relative surplus value extraction play critical conceptual roles in this complex dynamic process.

China is selected from among the BRICS as a special case study of DEs. More specifically, the complex dynamics underlying the relative surplus value extraction is explored in the context of growth, inequality and poverty. In addition--- and crucially--- the paper then analyzes the problems of industrialization and innovation in the 21st century context for China from a strategic perspective. The problems revealed through this case study can highlight many of the challenges of development, industrialization and innovation in the 21st century for the other BRICS as well as for many other developing countries. However, it must be pointed out that China is also a special ambiguous case in many respects with elements of capitalism along with some socialist elements reemphasized in the last 20 years and especially under Xi. There are also ecological issues that PRC is trying to tackle but it is not certain that it can do so in time to save our planet when the US is clearly going the other way.

The research strategy here is to avoid the danger of falling into overgeneralization and to emphasize the need for a radical change in the global ecological and economic environment and specific development and industrialization strategies. This is highlighted in the last two parts of this paper where the outlines of an alternative development strategy are given with empirical caveats about the crisis in GCO which may not lead to a dialectical resolution in time to save the planet. In this context, I have stressed the energy and ecological dilemma for China in this century that I have discussed in great detail elsewhere. As long as the current geopolitical situation persists, the pursuit of present development strategy of China will further increase its

energy dependence. For both political and economic reasons, China needs to rethink its development strategy. I have sketched elsewhere such an alternative strategy that relies much less on fossil fuels and emphasizes regional cooperation.

In the present essay, I discuss how the National System of Innovation of China can begin to move towards an (Ecologically and Economically) Sustainable Capabilities Enhancing National Innovation System or SCENIS. This SCENIS strategy will ultimately lead to a sustainable economy delivering reasonable growth with equity. A transition to a non-fossil fuel based knowledge and information economy will also be easier to effect under the proposed strategy. However, it is doubtful that such a strategy can be implemented for the GCO as a whole even if the complex mix of capitalism and socialism in PRC allows China to move in this direction. Therefore, in this era of unfolding ecological and other crises Rosa Luxemburg's slogan becomes even more ominously appropriate than before: either socialism or barbarism in the 21st century.

Methodologically, in addition to showing the applicability of classical political economy to problems of post WWII development within the dynamics of a complex system, the paper also presents the case for using Social Accounting Matrix (SAM)-based models for understanding problems of equitable development strategies. Linear as well as Nonlinear models which are in principle decomposable are presented in the appendix. The nonlinear modelling approach might prove to be especially relevant for studying the properties of multiple equilibria and complex dynamics. In terms of economic strategy and policy, such a theoretically rigorous and empirically implementable approach can underline the limits of capitalist development as well as the possibilities for at least countries like China and other BRICS with some precision.

Keywords: Real Competition, Relative Surplus Value, GCO, Complex Dynamics, Emergence, Development, Limits of Development under GCO, Crisis, Sustainable Capabilities Enhancing National Innovation System(SCENIS)

1. Introduction

The main purpose of this paper is to explore the locus and the dynamics of the so-called developing economies (DEs) in the global capitalist order(GCO). Using the classical idea of real competition as formulated by Shaikh and others, the paper explores how a crisis-ridden dynamics of uneven development particularly for developing economies emerges as part of the normal GCO dynamics. This is done within a conceptual context of complex systems dynamics in the GCO that includes a metropolitan center and its opposite, the periphery. In between the two there can be a small group of emerging economies---exemplified earlier by the East Asian tigers and now by PRC. In this paper, I cover systematically and sequentially the following areas that are dialectically interrelated:

1. Uneven Development in the semi-periphery and periphery
2. Real Competition and Uneven development in the semi-periphery and periphery
3. The East Asian Strategy of Capitalist Development in the periphery and semi-periphery.
4. Limits of the East Asian Strategy of Capitalist Development in the periphery and semi-periphery. What could at least a partial democratic socialist development be?
5. The ambiguous case of industrialization and innovation in PRC

Why the PRC case is ambiguous in systemic terms will be explained after the key categories of analysis are developed systematically.

In GCO, there can be much disorder at the micro level and yet there can also be the emergence of order at the macro level out of this disorder. This pattern of the capitalist order/disorder dynamics in the developmental economies can be explored theoretically by a series of real abstractions from the experience of developing economies within the uneven GCO development itself. This theoretical approach can explain some of the key stylized features of the DEs. Some limits of policies and of the so-called developmental state capacities can also be identified through this analysis.

As a corollary of this analysis, a related purpose of this paper is to explore both the prospects for and limits of industrialization and development with equity in the 21st century. It is impossible to be empirically exhaustive here within the scope of a single paper. Therefore, the strategic aspects of pre-1997 East Asian economies will be discussed and innovation system in PRC in the 21st century will be singled out for further analysis. For my larger book length empirical project I have chosen strategically to study some rapidly growing semi-peripheral developing economies in the global system such as the BRICS . The formal nonlinear model presented in the appendix may be seen as an initial step to put the analysis within a complex economic systems framework. Real competition and relative surplus value extraction play critical conceptual roles in this complex dynamic process. In this sense, the theoretical approach and the empirical strategy here are aligned with the recent move towards an evolutionary complex systems framework for economic and political economy

analysis(Shaikh 2017; Chibber 2003;Foley and Michl 1999;Ansperger 2008; Antonelli 2008; Colander 2000;Khan 1998, 2002, 2013, 2017a,b,c; Togati 2006).

With a tepid recovery from the global financial and economic crisis at the time of this writing as well as the still unfolding ecological crisis, the 21st century presents an even greater challenge for industrialization in the developing world than the post-WWII period. The changed global economic and ecological environment will shape the emergence of new technological and industrial paradigms and trajectories in significant ways (Dosi 2000, Khan 2004a). However, while the main prescriptive thesis of this paper argues for a radical rethinking of development and industrialization within an ecological political economy framework in the 21st century¹, there are still many relevant lessons---positive and negative--- from the post-WWII development and industrialization experiences and discourses. To put this in the proper analytical context, however, the problems of uneven capitalist development starting with Lenin's classic study of Russia need to be clarified. After this the role of real competition for capitalist development in the semi-periphery and periphery can be discussed more clearly. Then finally, we can put the Post WWII development experience in perspective. Therefore, the next section focuses on the development and industrialization experiences of the post-WWII period. This section also focuses in particular on the successful Asian economies in order to draw a number of still relevant lessons. Section 3 discusses the problems of industrialization and innovation in the particular 21st century context for China. The problems revealed through this case study can highlight many of the challenges of development, industrialization and innovation in the 21st century. However, it must be pointed out that China is also a special case in many respects and poses some problems for itself and for the smaller developing countries by the strategy of development it has followed so far. The research strategy here is to both avoid the danger of falling into overgeneralization and to emphasize the need for a radical change in both the global economic environment and specific development and industrialization strategies. This is highlighted in section 4 of this paper where the outlines of an alternative development strategy are given.

It should be noted at the outset that even during the post-WWII period , as some have pointed out (e.g.,Amsden(2008), , Jomo(2007,2001,1995), Khan (2004a,b; 1997), Khan 1983, Khan and Thorbecke 1988, 1989; James and Khan 1993, 1997a and b; Khan 2003 a,b,c; 2005, 2008a,b,c, 2010, 2011a,b,c,d; 2012; 2013, 2014;2015a,b;2016), Khan, Judzik, Spagnolo 2016)), there were at least two sub-periods. The first was an era of relative optimism during the Bretton Woods period of managed global capitalism. During this era, there was an overall strategy of development in the capitalist bloc that relied to a large extent on state-market synergy. It delivered fairly high growth for at least two decades in many countries but the distributional record was not impressive. Most importantly, the East Asian miracle with high growth and relatively benign distributional record throughout the entire post-WWII period(except

¹ The particular strand of ecological political economy that Victor Lippit and I have developed can be found in Khan(1983), Khan and Lippit(1993), Khan(1997a,b; 1998),Lippit(2005)Khan, Tamazian, Vadlamannati 2009), Khan(2010) .See also in the Chinese context,Li(2016,2015,2014,2013a-c). See also Khan(2023a-c; 2021a,b)

the post-1990 record of China) also had its beginning during this era. Much of the infrastructural and human resources foundations for the subsequent growth and industrialization in the four tigers--- and in retrospect, for China and India--- were laid during these two decades.

The second period---now that much of the smoke from the last thirty years has cleared-- - can be seen now as the demise of the Bretton Woods international financial architecture without any firm replacement except a dollar hegemony which now looks increasingly shaky. It is also seen as the era of Washington consensus which promised much but has delivered so far very little in the way of growth, investment and employment. Admittedly, both the periods were complex and a nuanced history is yet to be written; but the contrast is there. The rise of the Asian tigers including China and to some extent India has to be seen against this background. In this paper, the main argument regarding sustainable industrialization and development in this century is based on the idea of a complex economic system. The main conclusion is that while industrialization is both necessary and possible, a reasonable strategy must take into account the unevenness and complexity of the global economic system. Given that the developing countries themselves are at several different stages of development, there is no one-size-fits-all set of prescriptions. However, a nuanced and context-sensitive approach based on a realistic theory of development can still offer much help.

2. The Classical Political Economy of Development: Real Competition, Uneven Development and North-South Divide---Some Theoretical Considerations

2.1 Classical Marxist Approaches to the Development of Capitalism in the Backward Areas through the Self-Expansion of Value.

Marx never made a systematic theoretical and empirical analysis of the development of capitalism in the non-capitalist parts of the world in his time. One widely quoted remark found in the preface to the first edition of *Capital* has been seized by many scholars as Marx's definitive position:

"... the country that is more developed industrially only shows, to the less developed, the image of its own future."

Yet Marx was aware of the complexities of the actual development of capitalism in specific countries, for he avers in the same preface that the backward country "suffers not only from the development of capitalist production but also from the incompleteness of that development."¹ A uniform law of development of capitalism in each country would be particularly attractive to a positivistic social science. But was Marx a positivist? On the basis of a particularly clear statement by Marx (reproduced below) and other internal theoretical evidence in Marx's writing, Miller (1984) pronounces Marx to be a non-positivist. According to Miller, in the following passage Marx "emphasizes two features of his theory of history that would rule it out as unscientific if the positivist account is right."

In several parts of *Capital* I allude to the fate which overtook the plebians of ancient Rome. They were originally free peasants, each cultivating his own piece of land on his own account. In the course of Roman history they were expropriated. The same movement which divorced them from their means of production and subsistence involved the formation not only of big landed property but also a big money capital. And so one fine morning there were to be found on the one hand free men, stripped of everything except their labour power, and on the other, in order to exploit this labour, those who held all the acquired wealth in their possession. What happened? The Roman proletarians became not wage labourers but a mob of do-nothings; more abject than the former "poor whites" in the South of the United States, and alongside of them there developed a mode of production which was not capitalist but based on slavery. Thus events strikingly analogous but taking place in different historical surroundings led to totally different results. By studying each of these forms of evolution separately and then comparing them can easily find the clue to this phenomenon, but one will never there by using as one's master key a general historical-philosophical theory, the supreme virtue of which consists in being super-historical.²

Furthermore in *Capital* Marx also argues that the development of capitalism or any economic structure for that matter may show "infinite variations and gradations in appearance which can be ascertained only by an analysis of empirically given circumstances."

If Miller's interpretation of Marx's historical method and Marx's own statements are taken *prima facie*, then Marx's view of the development of capitalism in previously non-capitalist parts of the world after the first flowering of industrial capital as a social relation in England, must be seen as fairly complex, in principle. What Marx discovered were some crucial (and approximately true) general tendencies of the development of capitalism. However he had no explicit theory of development in the periphery and semi-periphery in the GCO. However, elsewhere I have tried to articulate this with the help of Marx's concept of the circuits of capital and their uneven development. Without rehearsing these again here we can move to what is perhaps the first significant Marxist analysis of capitalist development and underdevelopment in what we will call today the semi-periphery of GCO in the late 19th century.

In Lenin's *Development of Capitalism in Russia* (1899) one already finds a superb analysis of capitalism in a backward country. Some dependency theorists (Cardoso, 1974) have actually sought the authority of this book to give a 'Leninist' flavor to their views.

In arguing against the Nardoniks' position of instant socialism in Russia, Lenin presented a two-sided argument in 'the Development.' On the one hand contrary to the Nardonik's claim he argued that capitalism was developing in Russia. At the same time and because of this (uneven) development, the possibilities for development of proletarian politics and a complex transition path to socialism under concrete conditions were also there. This view, quite plausible within-the then existent Marxist tradition, is not without a certain internal tension, however. For the moment, let us note

² (Letter from Marx to the editor of the *Otecestvenniye Zapisky*, Nov. 1877, *Marx and Engels Correspondence*; International Publishers (1968))

the special features of capitalism in late 19th century Russia which Lenin discovered. The data showed the capitalist development of Russia to be real. Nevertheless, the rate of this development was extremely slow and the extent was quite uneven.

The latter feature was not surprising in itself, since the development of capitalism in Western Europe was also marked by unevenness. But the tardiness of the development and the persistence of traditional, seemingly pre-capitalist forms (another discovery of Lenin), needed explanation. Here Lenin relied on both an analysis of the internal development of class structure in Russia and the external factor of competition from Western European capitalism and at the same time a capital inflow from the center. The striking feature of this early analysis is the way Lenin combines the external with the internal. The capital from Western Europe accelerated the industrialization and helped the emergence of a bourgeoisie in Russia. At the same time, the weak and dependent nature of the Russian bourgeoisie, partly a result of its domination by foreign capitalists, prevented the development from being rapid and widespread. As Palma correctly points out, Lenin actually gave a great deal of weight to the survival of traditional structures in Russia in his explanatory scheme. Quoting Marx's earlier remark regarding the incompleteness of capitalist development in a backward country, Lenin refers to the 'abundant survival of ancient institutions that are incompatible with capitalism'. At the same time, Lenin notes the linkages, at least in production, between the factory and the handicraft industry or more generally the traditional, pre-capitalist and the modern, capitalist organizations of production.² Thus we can detect an uneven and turbulent dynamics of the circuits of capital in Russia.

In summary, Lenin in 1899 saw the development of capitalism in Russia as a slow motion replay of the development of capitalism in Western Europe. At the same time there is recognition of a complex interaction between the external and internal factors. The political conclusions drawn by Lenin from 'the Development, as well as his subsequent studies including "Imperialism ... " form the subject of a separate paper and will not be pursued here. What is important to emphasize is that capitalism from its very inception has been a system with expansionary drive rooted in real competition. Therefore, the global scope of capitalism is a logical development of inherent tendencies of capital. However, it takes place within a historically and politically determined spatial configuration. In modern capitalism, this has been the system of nation states. Furthermore, capitalism both in this global system and within nation states develops unevenly over time through a turbulent process. A crucial aspect of this uneven development is the increase in inequalities *ceteris paribus*.³

2.2 Real Competition, Uneven Development and North-South Divide

However, there is one lacuna in Lenin's classical work that is relevant to mention here. Like most Marxists of his time, he did not see the role of what Shaikh calls real competition in the classical political economy tradition, as crucial albeit in a highly

³ This was observed in classical Marxian literature. For more recent literature see, Khan(1983,1997a,b; 2002,2004 a,b; 2006, 2012,2017a,b), Picketty (2014), Shaikh(2016), Franzini and Pianta(2017) and Khan and Thorbrecke(1988,1989).

uneven context in the development of capitalism in Russia and other underdeveloped parts of the world. Here indeed, the idea of GCO comes into its own. In many ways, as Marx's chapters on primitive accumulation in *Capital* Vol. 1 discuss, capitalism has been tendentially a global order right from its beginning. Yet, the historic development of a GCO did not reach its maturity till the end of the 19th century. More than any other historic event, the conference in Belgium for the partition and plunder of Africa can be seen as the crucial historical marker for the maturity of GCO. Given the views of the 2nd international and Lenin's mentors such as Plekhanov, it is not surprising that Lenin did not see the real competition as the dynamic factor in mature capitalism and its earlier evolutionary stages as well. Perhaps what should come as a pleasant surprise is that even without a sufficient theoretical anchor—or put more strongly, with a partially wrong and largely economic determinist anchor--- Lenin empirically identified both external competition and complex internal factors working dialectically to produce a puzzling array of development and underdevelopment in Russia. Later, Gershenkron would develop some of these ideas---without analysing the implications for revolution---in his famous works on “advantages of backwardness”.

In chapter 6 of his *magnum opus*, *Capitalism: Competition, Conflict, Crisis* (2016), Shaikh takes up the idea of profitability and its relations to capitalism before moving to the second part of his book on “real competition” in classical political economy. Chapter 6 delivers an analytical definition of capital, discusses the determination of aggregate profit, and the details of their measurement. With this analytical apparatus at hand, in chapter 7 Shaikh points out correctly:

Capital is a particular social form of wealth driven by the profit motive. With this incentive comes a corresponding drive for expansion, for the conversion of capital into more capital, of profit into more profit. Each individual capital operates under this imperative, colliding with others trying to do the same, sometimes succeeding, sometimes just surviving, and sometimes failing altogether. This is *real competition*, antagonistic by nature and turbulent in operation. It is as different from so-called perfect competition as war is from ballet.

The mobility of capital is inherent in its existence. Capital tied up in labor, plant, equipment, and inventories is fixated and must be used up or sold off before it can adopt a new incarnation. But fresh money capital, borrowed or garnered as profit, always looks over the available list of avatars before making its choice. The profit motive rules in all cases.

Real competition is the central regulating mechanism of capitalism. Competition within an industry forces individual producer to set prices with an eye on the market, just as it forces them continually try to cut costs so that they can cut prices and expand market share. Cost-cutting can take place through wage reduction, increases in the length or intensity of the working day, and through technical change. The latter becomes the central means over the long run. (Shaikh:260)

More than any modern Marxist theory of imperialism---Leninist or otherwise--- the theoretical concept of real competition explains why under some conditions which are

quite plausibly present particularly during the expansionary phases of capitalism in advanced centers, there is a tendency to expand abroad. But strikingly, the tendency is present---indeed it might be a compulsion--- for capitalists of the center to invest abroad even during downturns as profitability sinks lower and lower in former centers of accumulation. But there is also a tendency to hoard capital, or with state fiscal-monetary intervention without tightened financial regulations, pursue speculative financial activities.

Shaikh further draws out the implications of real competition that will have important roles to play in the interpretation of our formal models in the appendix---the most important of these formally being the idea of turbulent equilibration:

Real competition generates its own characteristic patterns. Prices set by different sellers are roughly equalized as each tries to gain an advantage over the other. Profit rates on new investments are also roughly equalized over somewhat longer periods. Both of these processes result in perpetual fluctuations around various moving centers of gravity. This is the classical notion of *turbulent equilibration*, very different from the conventional notion of equilibrium as a state-of- rest... Supply and demand are part of the story, but their roles are not decisive since both can change in response to profit opportunities (Sraffa 1926, 538–539).

The notion of competition as a form of warfare has important implications. Tactics, strategy, and resulting prospects for growth are central concerns of the competitive firm. In turn, the relevant profit must be that which is defensible in the medium term, which is quite different from the notion of short-term maximum profit emphasized in neoclassical theory. *In the battle of real competition, the mobility of capital is the movement from one terrain to another, the development and adoption of technology is the arms race, and the struggle for profit growth and market share is the battle itself...*

It is important to understand that price equalization due to competition between sellers, as well as profit rate equalization due to competition between investors, always give rise to unintended outcomes. Prices tend to equalize because buyers gravitate toward the lowest price, which forces other sellers to adjust their own prices. Similarly, profit rates tend to equalize because investors flock to higher rates of return. This accelerates supply relative to demand in the favored industries and drives down their prices and profits. The rush toward riches close the gaps that initially motivated the agents while opening up new gaps which feed new arbitrage movements. The turbulent equalizations of prices and profit rates are quintessential emergent properties. (Shaikh 2016:260; emphasis added)

This mobility of capital globally with turbulent equilibration tendencies and emergent properties is the disordered “order” of capitalism globally. What mainstream economists after WWII chose to call the then new field of development economics can be more realistically and scientifically viewed as one part of the turbulent evolution of GCO. Let me elaborate by looking critically at the most important early “classical” model of dualism by W. A. Lewis and refer to a new formal version of a “dual-dual” model that pushes it more in the direction of real external and internal competition approach discussed above.

Lewis himself was aware of the quasi-Ricardian roots of his model. Without rehearsing the details, we can recall that the modern sector is the capitalist sector and generates growth. In this process of “development” surplus labor is released by the traditional agricultural sector. One can add a Harris-Todaro type migration model and arrive at a fully specified general equilibrium with straightforward linearized dynamics.

There are several problems with Lewis’ and all subsequent formulations of dualism, however. Just to mention two that I think are most critical, the absence of capitalist development in agriculture is analytically misleading and historically inaccurate. Without such a dynamic capitalist ---at least tendentially---agriculture, the source of surplus labor seems to be overpopulation. This is unhelpful analytically. With dynamic capitalist agriculture, reverse migration from urban to rural areas particularly during downturns may be quite significant. At any rate, this lack of dynamic thinking about an explicitly dynamic problem points to a second, even deeper theoretical problem. This has to do with equilibration. Although Lewis starts out by invoking classical ideas, his equilibria are entirely neoclassical. This is made clear in the subsequent versions of Ranis, Ranis and Fei and Fields models⁴. In Svejnar-Thorbecke(1982), there is an ambiguous formulation that could be interpreted as a deviation from the neoclassical formulation but no explicit analytical statement is made by these authors. Khan(1983) was the first theoretical generalization of dualism multisectorally. More importantly, chapter 2 of this work drew out historically the roots of dualism and formulated an early turbulent equilibrium seeking version, later refined in Khan and Thorbecke(1988) and Khan(1997). To put it sequentially from 1983 onwards, Khan(1985), Khan and Thorbecke(1988,1989), James and Khan(1993,1997,1998) and Khan(1997 and 1998) made more explicit the classical type of equilibria that are required for multisectoral dualist model dynamics. Jung and Thorbecke’s empirically implementable dual-dual structural CGE model is refined and extended further technically and conceptually by Khan(2004, 2006, 2007) in the direction of turbulent equilibria in a dual-dual model.⁵ What is important in this debate is to realize that a classical model of capitalist development in the formerly noncapitalist parts of the world can be formulated within the GCO via the concepts of real competition and turbulent equilibria.

3. Defining Development and Stages of Development in Light of Real Competition Theory and Some Common Strategic Features of East Asian Development Experience--- The ambiguous case of PRC

3.1 Development as a Complex Social- Economic- State Systemic Process:

Writing in 1926, in a biographical essay on Edgeworth, Keynes underlined some of the problems of complex human systems:

⁴ These models are discussed in Khan(1983) and Khan (1997) chapter 2.

⁵ The formalizations of all these models can be found in the references listed in the bibliography.

We are faced at every turn with problems of organic unity, of discreteness, of discontinuity--- the whole is not equal to the sum of the parts, comparisons of quantity fail us, small changes produce large effects, the assumptions of a uniform and homogeneous continuum are not satisfied.⁶

If anything, the developing part of the world economy today shows to even a greater degree the kind of complexity captured in Keynes's words above. Fortunately, systems theory and economic theory have both made some progress since those dark days. Although we are far from a genuinely complete theory of complex economic systems, efforts are underway that have already borne some interesting fruit in several limited areas.⁷ A review of even partially successful set of country experiences such as are contained in Fosu(2013) can be seen as case studies that reveal many facets of complex developing economies --each with its own sub-systemic characteristics to be sure, but also sharing some common strategic features. The purpose of this paper is to synthesize from a strategic perspective--- to the extent it is possible to do so--- the development experiences of the East Asia in particular and draw some appropriate lessons. The claim is that such an approach can lead to a theoretical view of an enabling developmental state that includes many features from the East Asian Developmental State model. But in our theory, we go beyond that model. In particular, it turns out that the theoretical basis of the East Asian Developmental State model must be crucially augmented by considerations of deepening of democracy during the developmental process. Furthermore, the systemic crises of accumulation and the deepening ecological crisis impose new challenges that the old East Asian Model did not address(Arrighi 1994, 2007, 2010; Khan 2010);Khan and Liu 2008; Li 2008)

However, at this point in our discussion, some clarification of the key term "development" is necessary in order to avoid ambiguities and confusions. In the rest of this paper, I will be referring to three concepts of development that are implicit in much of the discussion in the political economy of development literature. The first is the idea of development as growth with some structural change or at least the idea that this type of growth is the most crucial necessary condition for development. The second concept is derived by adding explicit distributional elements to growth--- particularly inequality and poverty. Both these ideas are shared by many development economists-- -- for example, many of the authors of the chapters in Fosu(2013) ---at least implicitly. Fields was one of the earliest in being explicit in discussing all three---growth, absolute

⁶ Keynes(1971-9), Vol. X, p. 261

⁷ See for example, Khan(2004a,b, 2003a,, 1998,1997;2012a,b) and the references therein.

poverty and inequality--- and his thoughtful model in the Quarterly Journal of Economics (Fields 1979) article alerts the reader to the performance of a developing economy in all three areas and derives--- at least partly--- a logic of further necessary reforms following from his cogent analysis of the three aspects of development in this sense. Warr(2008) is a more recent example for the case of Thailand.⁸

The third--- and the broadest approach to development discussed here--- is in terms of Sen's idea of capabilities and its further extensions. In this view, development is really an extension over time and space of freedom, particularly the positive freedom to lead a certain type of life an individual has reasons to value. Sen and his coauthors have, of course, used this idea, and following Sen, many others have done so as well (Sen 1992, 1999, 2009; Nussbaum 1995, 2000; Khan 1998, 2014). Yet, in so far as there is a normative aspect about development being a "(public) good" that is a premise for the whole project such a view is consistent with the analyses of the East(and to some extent Southeast) Asian Development. Warr's essay on Thailand again is quite explicit in mentioning both the positive achievements and the shortcomings of Thailand's record and its strategy which can fit into this broad systemic capabilities approach. For Korea, Keun Lee has gone further. In fact, Keun Lee's perceptive comments on the possible role of democracy in development extends considerably the terrain of discussion in the direction of the "development as freedom" perspective .

It would seem, therefore, that there is an implicit agreement that development is "growth plus" other things (Khan and Weiss 2006). While the list of "other things" may vary somewhat, none of the thoughtful scholars of development would want to equate growth and development. Yet, as the East Asian experience shows, generating high growth may be a useful means towards development. But one must also pay careful attention to what can be called "the political economy and the well-being consequences of growth". Consideration of these factors leads inevitably to the role of state. The East Asian experience suggests that the role of states in their developmental process was "enabling" but the transition from an authoritarian to more democratic forms of state was slow. In terms of class character, these states are still bourgeois with accommodations for popular interests that are the results of long and hard struggles by the masses from below.⁹ This suggests a change in strategic orientation for the progressives in the 21st century. Such an approach necessarily will need to take differences---particularly class, gender, racial-ethnic differences ---seriously in a critical theory of equalizing capabilities (Khan 2009, 2012a,b, 2014a,b).

What precisely can be the character and role of such an "enabling" developmental state in the 21st century? What are the limits of development strategies within GCO by such a capitalist but "enabling" developmental state ? We try to answer these questions in the next sub- section.

⁸ See also Warr(1993,1999,2005) for nuanced analyses of the various aspects of Thailand's development experience and Jomo(2007,1995) for Malaysia..

⁹ Prashad(2014) presents a history of the global South. More importantly, the last chapter of Prashad(2014) discusses critically the details of the emerging movements in the global South and their transformational potential.

3.2 An Enabling Developmental State for the 21st Century: Abstracting from the East Asian Real Capitalist Development and the Ambiguous Case of PRC¹⁰ as a Mixture of Capitalist and Non-capitalist development

At least since the classic work by Johnson (1982) on MITI and the Japanese economy, the role of the developmental state has received much attention. Woo-Cumings (1999) is a good collection of papers that explore various aspects of Developmental States. Meredith Woo-Cumings (1999: 1) presents the theory of developmental state as the explanation for the East Asian industrialization. Earlier, Chalmers Johnson had stated: ‘it is a shorthand for the seamless web of political, bureaucratic, and moneyed influences that structures economic life in capitalist Northeast Asia’ (Johnson 1982). Johnson in his book *MITI and the Japanese Miracle*, had coined this term for analyzing Japanese industrial policies. According to Woo-Cumings, the concept of the developmental state was originally used to analyze a plan-rational capitalist system like Japan, ‘conjoining private ownership with state guidance’ (Woo-Cumings 1999: 2). Johnson explains in his contribution to the history of the developmental state debate that ‘one of [his] main purposes in introducing the idea of capitalist developmental state [...] was to go beyond the contrast between the American and Soviet economies’ (Johnson 1999: 32). At least one part of the theory is drawn from the history and the theory of mercantilist intervention of the state in the economy. But in the fashion of Hamilton and List, the developmental state theory is applied to late capitalist development in the sense of building industrial capitalism within a World Capitalist System(WCS) where early starters are already in a more advanced stage of industrialization. Historically, in Bismarck’s Prussia and in Japan during the Meiji era the developmental states carried the burden of starting and then sustaining the industrialization process. Scholars such as Reinert have traced the history of interventionist states all the way back to the Renaissance (Reinert 2007)

After World War II, Japan, Korea and Taiwan were particularly successful in building both the developmental state and industries that were export-oriented. The debate picked up speed after the work of Amsden (1989) and the World Bank Study of 1993. Wade (1990) studied the Taiwanese economy in detail from a “governing the market” perspective. Chang’s study of Korean industrial policies were important to develop the thesis further. Khan (1983, 1997) discussed the technology policies of Korea and

¹⁰ Although this paper does not discuss financial fragility in China or BRICS, the capitalist part of PRCs economy is financially fragile from the evidence available. For a recent discussion, see Engen Tham, Matthew Miller and David Lague(2017), “China’s leaders fret over the debt lurking in the shadow banking system” <https://www.reuters.com/investigates/special-report/china-risk-shadowbanking/> Moody’s estimates that assets in the shadow banking system may have reached a value of 86.5 percent of PRC GDP. See also my paper discussing the financial systems of BRICS within the global financial architecture, H. A. Khan (forthcoming), “Complex Financial Systems Governance and the BRICS in a New Global Financial Architecture”, PB Anand, F. Comim, S. Fennel and J. Weiss eds. *Oxford Handbook on BRICS and the Emerging Economies*, Oxford: Oxford University Press. See also Khan(2004b).

advanced a variant of a theory of state-market interaction in multiple dualisms within a developing economy. Khan and Thorbecke (1988, 1989) had applied a similar theory to study the choice and diffusion of technologies for Indonesia by using a social accounting matrix. Khan(2002,2003a,b,2004a, b) developed nonlinear models of “governing the market” and innovation and applied these to both Korea and Taiwan.

As many have emphasized (Amsden 1989; Chang 2008, 2007, 2003, 1994; Evans 1995, 1998, 2007; Ghosh 2009, 2010;Jomo 2007;Khan 1983, 1985, 1997a,b, 2002, 2003a,b,2004a,b, 2012a,b, 2013; Wade 1990;Weiss 1998), a set of encompassing institutions where the state is both an initiator of development policies and builder of development institutions is a crucial determinant of development success. The state is also a settler of conflicts before they became disabling as in many African countries. This enabling state shows “embedded autonomy”(Evans 1995). It also analyzes state capacity as a special form of infrastructural power(Mann 1988; Weiss 1998) and states can use this power to lead structural transformation of the economy. Weiss calls such a state-business class relationship one of governed interdependence. In East Asia such interdependence has been important.

More specifically, a dynamic picture of the leading role of the enabling state emerges. Over time. The state provides disciplined support for export-oriented sectors through directed credit and other subsidies. The state also coordinates investment across sectors and within industries . It invests itself in areas where private risk absorption capacity is too low. This is important in building up a national system of innovation in particular. The state also steps in to manage sectoral and macroeconomic crises ensuring a relatively smooth accumulation process to proceed. However, the distributive conflicts were lessened for Japan, Korea and Taiwan through US-imposed land reforms after the war. In China on the other hand, an egalitarian society with a Gini coefficient between .25 and .28 in the 1970s became highly unequal from 1990s onward with Gini index over .45.

Given our capabilities perspective in section 3.1, we need to include among the characteristics of the Enabling Developmental State for the 21st Century its capacity to build an egalitarian development strategy from the beginning. In addition, democracy must be deepened also from the beginning. Khan(1998, 2008a,b,2009,2010, 2012a,b) has attempted to build a theory where *egalitarian distribution and deepening of democratic institutions* and practices along with the standard industrial, trade, monetary-financial and other developmentalist policy making of the state have theoretical salience. Furthermore, given the deepening ecological crisis, this type of state will have to devise policies for *at least mitigating the ecological crisis*.

It is such a state that we can call at least a partially non-capitalist *Enabling Developmental State for the 21st Century*. Both technically and from a social perspective efficient but egalitarian innovation systems throughout but particularly after the middle income stage become crucial in terms of enhancing people’s capabilities rapidly and widely. Khan(2012a) has therefore replaced the idea of a national innovation system(NIS) with that of an augmented national innovation system(ANIS).

A thoroughly innovative Enabling Developmental State for the 21st Century will augment both efficiency and capabilities of people in an egalitarian manner. It is clear that the state of this kind cannot be formed unless popular forces can launch movements and programs of their own. Is there any hope of this being achieved in the next few decades? Prashad(2014) discusses the complex processes underway in the global South now---particularly in Latin America. Although by no means guaranteed, the achievements of people's movements in Argentina, Brazil, Chile, Bolivia, Venezuela and elsewhere give us some room for optimism(Peet 2007:Peet and Hartwick 2009). But the project has barely been started. A new theory of an Enabling Developmental State for the 21st Century that both nurtures and is nurtured by these movements will be of a kind that can play a counterhegemonic role. We are at the beginning of this process. Such a process already shows a multidimensional nonlinear complex system of GCO breaking down with a combination of ecological-economic, political, social and ideological crises. We cannot predict the forms resistance and transformational movements will ultimately take. However, the emerging self-organization of people's movements will undoubtedly take multiple forms ranging from anti-capitalist local resistances to national-regional-international political parties and broad-based social movements and new social formations.¹¹

We now ask the question: how do we conceive of an initial strategic plan that draws from the best experiences of the East Asian Developmental States and augments these with mainly egalitarian and democratic elements for the 21st Century using the third, encompassing definition of development that will force us to think beyond the GCO ?

¹¹ Thus, without falling into self-refuting relativism, there is a way to accept epistemic limits, resist imperial power-knowledge-discourse schemes and formulate positive pro-people programs that are internationalist but local and regional at the beginning and with time passing, ultimately global in scope. Prashad(2014) presents a good case for the local-regional-global sequence in the current context. I along with others have argued to accept the proposition that capitalism will not be able to solve the currently unfolding ecological crisis as well as the other crises endogenous to the WCS. If not the other crises, the ecological crisis itself, left unchecked, will destroy human civilization. Thus capitalism which is a complex exploitative system must be transformed into a more harmonious people and nature oriented system. It has to be understood that capitalism which has created the ecological and other crises, is a *global* system and ultimately can only be defeated by a *democratic global movement*. Thus although I am critical of their insufficient appreciation of the political economy of complex exploitative global capitalism, I accept much of the postdevelopment school's criticism of development as expressed for example by the work of Escobar, Rahnema and others. In fact, I have tried to make many of these cultural and ecological criticisms in addition to the critical political economy analysis of global capital, starting with Khan(1983) and continuing till now, without falling into the epistemological and ethical-political impasse of the postdevelopment school. See Khan(1998,2009) for a sympathetic critique of poststructural and postmodern turns and their application in postdevelopment thought, and an alternative critical positive construction of a dynamic democratic-participatory counterhegemonic development from below that can deepen with time. Richard Peet and Elaine Hartwick (2009) present a very fair summary of the various poststructuralist and postdevelopmentalist positions, ending with a thoughtful critique and defense of "critical modernism". It may be that when the new pro-people and deeply democratic dynamic system is more visible than it is now, we could describe the emergent features more fully and find a term which is more adequate than "development". I would like to keep that possibility open. On ecological crisis and capitalism in the 21st century, see Li (2008), Khan and Lippit(1993 and 2007) and Khan (1997a,b,1998, 2010).

3.3 Limits of Capitalist Development: An Eleven Points Characterization of a Strategic Approach towards Development as Freedom in the 21st Century

Synthesizing the Experiences of the East Asian countries further reveals some common strategic orientations as well as the effects of changes in external environment and shifts in policies over time. This is consistent with the characteristics of complex economic systems which are nonlinear with multiple equilibria and path dependence. Over time, one may observe the emergence of structural shifts in some cases, stagnation in other cases depending on initial conditions, strategies, policies and external environment among other things. For the cases discussed in the vast literature, there are many specific variations within each. However, they also share to various degrees many specific features listed below. It must be kept in mind that in the 21st century, ecological sustainability with justice to the poor people and their needs, will have to act as a constraint. But this applies particularly to the duty of the developed countries to curtail their consumption in general, and of nonrenewable energy consumption in particular.¹²

1.Strategic Openness to various degrees with Thailand being the most open and Viet Nam¹³ the least. But in all cases there is a strategic commitment to export promotion and further goals of moving up the value added ladder. It should be kept in mind however, that there can be a "fallacy of composition"(Cline1982, Khan 1983, Mayer 2002, Razmi and Blecker 2006) in claiming that all developing countries need to do is to pursue an export-led growth policy. Reciprocal demands may not exist sufficiently and the ensuing competition for export markets in developed countries may create winners as well as losers. Therefore, what may be needed in the future for other aspiring countries is a strategic approach including the development of national and regional markets and the creation of dynamic comparative advantage along with a number of other policies and institution building processes described below.

2.Heterodox macroeconomic policies for stability¹⁴--- Japan, Korea and Taiwan and many Southeast Asian countries such as Malaysia, Viet Nam and Singapore display more of a mix of heterodox policies. It seems that the rigidity of Washington consensus particularly in this area is rejected by the experiences of developing economies like Japan, China, Korea, Taiwan, and Viet Nam. In particular, use of fiscal policy, monetary policy and exchange rate policy together with trade and selective industrial policies can build an industrialized sustainable economy with good jobs and decent

¹² For informed analytical discussions of the experience including the implications of capitalism in PRC and its socialist prospects, see Khan(2004a,b; 2013, 2017) and especially Li(2016,2015,2014,2013a,b,c;2009a,b;2008).

¹³ However, see Thoburn et. al.(2007) for an insightful and nuanced discussion of Viet Nam's trade-orientation and policies for the textiles sector.

¹⁴ See Jomo and Nagaraj(2001) for a good discussion of heterodoxy in this context.

incomes for the people both in rural and urban areas. Further discussion of this last item can also be found under points 4 and 5 below ---Agricultural Development, and Industrial Development and Structural Change, respectively.

3. Creation of institutions for productive investment---this exists in all cases, but Korea seems to have gone much further than the others much earlier. Starting with the reforms in the 1960s, it moved through several successive stages and is now trying to find appropriate technological niche in a world that is moving towards a convergence of information, bio and nano- technologies by 2050. The role of state in the creation of these institutions is still very prominent. China has followed with its own plan for building an innovation system (Gabriele and Khan 2010).

4. Agricultural development--- Earlier, in the immediate post-WWII Keynesian-liberal and Social Democratic Spirit Japan, Korea and Taiwan carried out land reforms. China followed a revolutionary socialist path and land is still legally held collectively even with the current responsibility system. Among the poor Asian countries Viet Nam probably put through the most egalitarian pro-peasant development policies after its victory in the national liberation war in the 1970s. Warr(2008:p.12) describes the importance of agriculture in the Thai case.

Viet Nam's reforms in Agriculture are evaluated by Thoburn(2008) who points out the role of state in promoting new crops such as cashew.

5. Industrial development and structural change-- the strategic perspective in this important area suggests that the successful Asian countries to various degrees pursued a continuously unfolding and dynamic set of policies with much trial and error. The retrospective attempts to tell a coherent story have often led to an overly deductive picture where good performances supposedly follow from a few , usually neoclassical economic principles. The Malaysian case study is a good and convincing counterexample. Jomo and Wee(2008:p.10) describe some changes in strategy and policy for Malaysia within specific time-sensitive contexts illustrating this counterexample.

The case study of Viet Nam also confirms the suspicion that there is much that is improvised and *ad hoc* during the earlier phases of apparently successful development cases. The lesson here is perhaps to avoid major resource allocation distortions(as documented by the Thai case also) and constant monitoring and policy revisions when existing policies do not work well.The political preconditions for this are in the background even in the Malaysia and Viet Nam papers which are more explicit in these regards than the other two papers.

6. Creation of technological capabilities--- here the Korean case stands out as a very apt illustration of creating technological capabilities throughout the entire growth and development trajectory in definite stages.¹⁵ (Lee2008,pp.4-5)

The Malaysia paper by Jomo and Wee also recognizes this essentially strategic aspect of creating technological capabilities during medium to long run development. It is also clear from the Thailand and Viet Nam cases that strategic concerns with the creation of appropriate technological capabilities have been and continue to be very important. Khan(2002 and 2004a) has discussed the interventionist role of the state in Taiwan in this area.

7. Technological learning and innovation--- creating national innovation systems in particular requires the creation of specific institutions and technological learning over time. Ultimately, if development is to continue beyond the catching up phase, this may present the most crucial set of policy challenges. Here, the paper on Korea by Lee(2008) is an admirable attempt to sum up the lessons.

Both state and civil society have to play important roles. At an earlier stage, the state necessarily plays a large and activist role . At a later stage, however, the creation of technological capability has to rely on a private-public partnership at both the precompetitive and the competitive phases of innovation(Khan2004a).For China, Gabriele and Khan(2010) present an analysis that points out the key role of the state in building an innovation system.

8. Direct Foreign Investment and Foreign Aid--- these factors have played a role for all East Asian economies but perhaps more so countries like Thailand, Viet Nam and Malaysia. Investment from abroad has perhaps been more significant than aid per se. However, internal generation of investible funds and public sector support have also played a crucial role---particularly in Korea. DFI in manufacturing sector can be important as the Viet Nam (and also the Thai and Malaysian cases) case shows.

Foreign Aid-- particularly Japanese aid--- has played a role in the development of Thailand and Malaysia but in the Asian cases the leveraging of aid for domestic development has perhaps been more important than the actual quantity of aid.¹⁶

One must be aware that in many cases aid and DFI can also lead to external dependence. A developmental state cannot surrender its sovereignty in domestic decision making capability and flexibility to foreign experts in exchange for aid. Khan (2003a and b) points out some of the pitfalls in aid and DFI regimes. Ultimately self-reliant domestic institution building process is the key to sustainable development.

¹⁵ See also Lee(2006) for a contrast of Korean experience with the Washington consensus and Khan(2008, 2002,1998 and 1997) for a discussion of the Korean (and Taiwanese)case(s) in the context of a distributionally sensitive growth model for positive feedback loop innovation system.

¹⁶ This is not to say that the quantity does not matter. Also for very poor countries today, aid can fill crucial financing gaps. See Khan(2003b) on these issues. However, surrendering domestic decision making capability and flexibility to foreign experts in exchange for aid is not strategically helpful. If there is such a pressure then it may be necessary to forego aid.

9. Poverty reduction strategies-- these are a varied set of policies that are necessary in addition to growth. Although growth is a very important component of such a strategic approach to poverty reduction, in all cases specific policies targeting both rural and urban poverty were undertaken. In case of Thailand and Viet Nam, it can be argued, such attention for some time to come is still a necessary part of a coherent pro-poor development strategy. This suggests a "growth plus..."(Weiss and Khan2006) strategy for development.

It must also be kept in mind that the move in 1999 by the IMF and the World Bank and other Northern Development organizations to make anti-poverty policies the core strategy for development is not credible. First, it was a political response to the crisis created by the failing and (after the 1997-98 financial crises) disastrous neoliberal policies. Second, even without this political background, without overall sustainable development, anti-poverty policies are only palliatives. Poverty can only be ended globally when exploitative accumulation by dispossession can be ended.

In addition to the nine sets of factors discussed above, there are also somewhat random, historically contingent factors. The Jomo and Wee paper on Malaysia acknowledges the presence of such factors explicitly. But even a quick look at several other cases will reveal historically contingent factors ranging from momentous events such as wars and revolutions to more usual changes in domestic and international political factors and changes in policies that depended on crucial personalities such as that of President Park in Korea in the 1960s.

Finally, from the enhancing of social capabilities of people perspective, there is a broader strategic consideration. We formulate this aspect of development as freedom as a two point strategic proposal in addition to the nine points presented above. We submit that for a capabilities enhancing enabling state of the 21st century with the multiple ecological-economic, political, social and ideological crises facing the planet, the following two items are indispensable:

10. Income and Asset Distributional Equality:

This is more of a challenge today than it was in post-WWII setting. Vibrant egalitarian anti-free market movements were widespread--even in the US. A combination of cold war policies and then a revival of Hayekian and other varieties of neoliberalism in the 1980s coinciding with the global crises of WCS made Income and Asset Distributional Equality an anathema among the mainstream. However, the greatest reversal was in China in the 1990s. Today Chinese leaders are at least partially rethinking this policy mistake.

But the greatest hope here comes from the people's movements from below all over the world and their partial successes in Latin America in particular. However, egalitarian

goals need to be explicitly put on movement agenda's and concrete strategies and tactics devised. When in power, the energies of such movements then can be largely directed towards making the objectives more concrete and solving practical problems of implementation. Through learning feedback mechanisms, mistakes can then be detected and corrected and further appropriate modifications made. Such a process cannot be anything but deeply democratic. This is our final strategic point.

11. Deepening of democracy through struggle and practice:

The theory of deepening democracy is derived from a history of struggles from below.¹⁷ In the uneven world of 21st century described by Prashad(2014) and many others, the struggles for democracy take many forms and will differ from one place to another. But the struggles for basic needs such as food, clothing, shelter, health care and education are important everywhere. With ecological destruction, movements to save the global commons are crucial. In both these movements the voices of women, minorities, workers and peasants are important. One group whose role needs to be underlined is the indigenous peoples of the world. Their increasingly progressive and leading role in places like Bolivia is exemplary. Movements everywhere can learn from them. New forms of deliberative democracy and advancing human rights for the people can be discovered only through these struggles. Even when state power is held by the minority dominant classes, such struggles can lead to some democratic deepening. Alternatively, they can lead to minority exploiting classes being forced to share some state power with the popular classes.

Thus, even without complete hegemony and state power, popular movements can influence infrastructural aspects of state power in particular. Comparative studies by political scientists are now emerging. For example, Schneider(2015) contrasts these two scenarios for contemporary India and Brazil.

In my view, both in India and Brazil---perhaps particularly in India---the democratic deepening needs to go much further. But the successes, however limited in these two cases, underline the role of mass progressive movements from below. These also point to the need for organizing under a coherent transformational strategic perspective and tactical program. Although no country can succeed by following mechanically the experience of another country, as outlined above, a number of helpful policy and institutional lessons can still be drawn by countries like India and Brazil.

To sum up, the Asian cases offer a set of concrete examples of the growth and development experiences during the post WWII period within the GCO. However, most of them do not meet and perhaps within the limits of GCO, can not meet completely or even partially the last two criteria of egalitarianism and deepening of democracy. This is to be expected in the profit driven real competition and uneven development in the GCO. But within the GCO, a few countries under historical conditions more favorable than they are today were able to follow at least the 9-point

¹⁷ I have discussed these issues related to deepening democracy in greater detail in Khan(1998, part II; 2003a,b;2012c and 2014) and in Han et.al.(2015) in particular.

strategy if not the 11-point more democratic egalitarian path which is possible only by breaking away from both GCO and authoritarian socialism.

There is a long debate in Marxist literature on socialism. Marx himself changed his mind several times. But there are two broad lines of thought in Marx and since Marx. Bernard Moss sums up these two complex strands in his article on this subject:

Marx's positions and analyses shifted with circumstances. He made three successive different interpretations of the revolution of 1848 and the Paris Commune, but that does not make his politics merely circumstantial. There are contradictions between texts and within texts, but some explanations are more robust, some determinations more fundamental, and some historical formulations more balanced than others. His texts must be read as part of a corpus and understood in historical context, particularly in relation to the working-class movement that gave unity to his life and thought, for it is in the texts and formulations that engage with the working-class movement that Marx is the most illuminating. Conversely, it is when he loses touch with the movement - either when he takes up an ultra-revolutionary position, as in 1849-50 or, in reaction to its failure, a detached objectivism as in 1851-52 - that his vision becomes skewed and distorted. The first of these mistakes was subjectivist - the belief that all was made possible by political will; the second was objectivist - the belief that human action could not change the immutable laws of history. These deviations occurred because of the disintegration of the social democratic movement with which Marx identified, particularly in Germany; but the subjectivist one, amazingly enough, prefigured the future, both the Paris Commune and 1917. (Moss, *Socialist Register*, Vol.34, 1998)

Marx's writings after the Paris Commune dealt with socialism or what he called the lower stage of communism somewhat at length in the Critique of Gotha Program. Two points stand out (see Khan 2014b for details¹⁸). One is the need for maintaining proletarian political power and institute genuine people's democracy. The other is to socialize production and reduce inequality progressively as quickly as possible allowing for differences in specific circumstances of particular cases. We have had several experiences with such transitions in the 20th century. The earliest one---the USSR---has met with demise. The largest structure still standing and publicly affirming its commitment to socialism is PRC. For this reason it is specially important to study this case. Instead of taking a position that identifies PRC with either capitalism or socialism, I take the position justified by fuzzy logic that allows one to say that China has many capitalist characteristics---particularly in allowing some large private firms to operate and fortunes to be accumulated. Internationally, it has bought into WTO protocols. At the same time, under Xi, attention has been focused on issues of corruption, inequalities, inefficiencies, socialist culture and long term transition.¹⁹

In the spirit of experimentation with rapid feedback and flexible policy making informed by a strategic medium to long run perspective, much can be done by the Chinese policy makers who are imaginative and pragmatic at the same time. Dynamic learning and flexible institution building are essential components of such a strategic approach to development. I now discuss this particular case in the specific areas of

¹⁸ See also the excellent article by Richard Wolff, *Alternatives to Capitalism*, Critical Sociology, 2013, Vol.39(4), pp.487-490

¹⁹ See the full report of the 19th congress of the CPC.

industrialization and building an innovation system for the 21st Century. Although I remain noncommittal about whether PRC is completely capitalist now (I along with people like Naughton, think that at least during the last two decades the relentless neoliberal strategy has run into some resistance recognized by post-Jiang Ze-min leadership), there is much of interest strategically in this ambiguous case.

4. Chinese Industrialization and Innovation System with complex turbulent dynamics: Limited Relative Surplus Value Extraction---Moving Towards a SCENIS?

This section²⁰ analyzes the available evidence of China's S&T, R&D, and innovative capabilities, to provide an assessment of the effectiveness and potentialities of its national innovation system (NIS)), and to formulate some preliminary policy suggestions aimed at improving China's overall innovation strategy. China's innovation strategy aims at embodying world-class best practices from technological world leaders and successful late industrializers, but is also peculiarly Chinese in at least two crucial aspects. The first is China's sheer size, which has allowed her to leapfrog to rank 2 worldwide in terms of the absolute quantitative magnitude of its China's NIS, at a stage when it still far lags behind all technological leaders in terms of per capita educational, technological, and research achievements. The second is China's specific form of market “socialism”, which has the potential of conferring her leaders an outstanding advantage in the crucial area of strategic planning, i.e. the capability to master national resources and to earmark them towards key goals accordingly to a clear set of priorities.

China's goal is to engineer in a relative short period a decisive qualitative leap in her NIS, developing a systemic ability to generate world-class indigenous innovations. In addition to fostering technical progress, China's development strategy shall also take into account the challenge of establishing a model of innovation compatible with an equitable pattern of income distribution and environmental sustainability, thereby paving the way to the eventual evolution towards a higher and more developed form of socialism. This is the expressed aim of the Chinese leadership. However, the simple NIS approach is not necessarily sensitive to these strategic requirements, and therefore there is a need for more advanced analytical and planning tools. In this context, I propose to consider the utility of nonlinear models of the positive feed back loop innovation system class, which are suitable to chart strategically the market “socialist” course, as their internal logic is consistent with China's unique catch up strategy.

By the turn of the century, China's R&D sector was growing rapidly in size and effectiveness, yet a major reorientation of resources towards research activities had not materialized yet. Major policy changes had been taking place in the 1980sand 1990s, and China's R&D system was undergoing two main and apparently contradictory, but in fact potentially complementary transformation trends. On one hand, there was a

²⁰ This section draws upon my joint work with Alberto Gabriele of UNCTAD. It does not reflect the official views of UNCTAD or any other UN organization.

powerful drive towards commercialization and decentralization. On the other hand, the government was earmarking large resources and according an increased degree of priority to a new generation of national research programmes. The innovative capacity and the technological level of Chinese productive enterprises were improving, particularly so in the state-owned sub-sector, where managing practices and property relations were undergoing major changes (Gabriele 2002). In the late 1990s and early 2000s China kept investing heavily in its R&D and S&T sector, and reforming its NSI. Similar patterns, to a lesser extent, were observed in other semi-industrialized developing countries.

In the meantime, further evidence is accumulating on the key role of R&D in boosting economic growth (see David et al. (2000), Arora et al (2007)) and on global technological trends, which point towards an ever-increasing divergence between developed and developing countries. Only China and (possibly) a very small group of other semi-industrialized countries are beginning to close the technological gap separating them from the world leaders (see Fagerberg, Knell, and Srholec (2007)). However, there are also signs of a sort of "research and innovation fatigue" which appears to be emerging in the developed world.

4.1. China's NIS and the linkages between industry and science

China's NIS has witnessed remarkable advances since the early 1980s, as a result of a series of reforms aimed mainly at improving its effectiveness and closing the excessive gap which traditionally separated university-based research activities from the technology absorption and innovation needs of the enterprises system. The main thrust of reforms has been to diversify the country's NIS and to strengthen its market-orientation (or market-compatibility), but the role of centrally-managed large, long-term research programs has also been enhanced. These reforms, along with the ever-expanding availability of financial resources made possible by economic growth and by the strong role of the national state, have allowed China to achieve remarkable advances. As a result, for instance, China's NIS is far superior to that of the other Asian emerging giant, India, in virtually every aspect (see Dahman (2007), Schmitz and Stamm (2007), Kash, Augur, and Li (2004), Hung (2008)).

Several organizational and institutional structures which proved their validity in the context of developed market economies are also being studied, experimented, and in some cases adopted in China, but such a pragmatic approach does not amount to an attempt to ape western examples. Actually, "It is far from clear that evolving into an innovation system similar to that found in developed market economies is possible or even advisable objective for China or other countries emerging from central planning regimes and Soviet-style industrial organization....". On the contrary, "it is necessary to accept the possibility that fundamentally different but equally viable national innovation systems could emerge in China, other formerly centrally planned economies, or other nations with similarly very different legacies of industrial organization and social systems Policymakers would then be able to better evaluate which system structure is most appropriate, given the particular characteristics of their

national context and the costs and likelihood of successfully introducing changes to move towards an alternative system structure" (Liu and White(2001), p.1112).

The most visible change in China's NIS is probably the progressive shift of the bulk of R&D activities away from universities and specialized research centres and towards industrial enterprises. However, universities participate in many of the most ambitious basic research endeavors, and often play a crucial role in their implementation. For instance, universities carry out about 1/3 of the "863projects" and 2/3 of the projects funded by National Natural Science Foundation (NNSF) (Wu (2007), Hu and Jefferson 2004). In order to re-balance the roles of the different actors in the R&D scene in favor of the academia, the Chinese government is earmarking an increasing volume of funds to elite universities, mainly through the Ministry of Education (MOE). Elite universities are expected to lead in national Deprograms and projects, facilitate technology diffusion and pullovers, promote spin off companies, incubation centers, and open laboratories for R&D sharing, to bridge foreign technology and partners. This emphasis on the role of universities in engaging directly in the development, production, and commercialization stages of their research results has been dubbed "forward engineering " by Lee. According to him, forward engineering is a peculiarly Chinese component of the "Beijing Consensus", a comprehensive and proactive catch-up strategy very different from the "Washington Consensus" and partly, but not fully similar to that followed before by other successful Asian latecomers such as Korea and Taiwan (see Lee 2006a, b and Lee, Hanh, and Justin Yifu 2002). Among other initiatives, a very important one was project 211, aimed at funding the construction of campuses and developing new academic programs in key scientific areas all over the country (Hsiung 2002) during the 1996-2000 Five Year Plan period.

Other programs promote specifically university-industry links. The first one of this kind was launched jointly in 2001 by the State Economic and Trade Commission(SETC) and the MOE. The goal of this program was to set up state technology transfer centers in six universities, in order to promote the commercialization of technological achievements. After a long debate that concluded with the official position that universities have a threefold mission - research, teaching, and commercialization - MOE issued another directive in 2002, encouraging the development of university start-up enterprises. Research and technological innovations are seen as crucial channels through which universities contribute to national and local economies. (see Ma 2004, Zhang 2003, (Haiyan, Yuanlong and Kaiyuan 2006, Hong 2006, Motohashi 2005).

As mentioned above, however, the bulk of China's R&D is presently beingcarried out by enterprises, many of which are large SOEs. China's large SOEs notonly did not die out, but have managed so far to resist and even to thrive after over aquarter-century of market-oriented structural changes. SOEs reforms were carried outin the framework of a complex, ever-changing and opaque institutional environment,characterized by a weak and ambiguous -albeit increasing- degree of protection ofproperty rights in general and of intellectual property rights (IPR) in particular.Shedding light on this apparent (for orthodox economics) paradox, most studies oninnovation among Chinese productive enterprises found that substantial progress wasgoing on, and that SOEs were

capturing the bulk of S&T resources, but exhibiting a less-than-satisfactory capability of translating them into true production improvements. The innovative capability of SOEs, however, appears to have been further enhanced in the mid-2000s⁶, thanks at least partly to the economies of scale and scope made possible by the "grasping the big, enlivening the small" policy. The combined profit of the 150 or so companies controlled by China's central government reached Rmb1,000bn (USD140bn), more than 200% higher than five years earlier. By end-2007, the list of the world's 10 most valuable companies contained four groups controlled by the Chinese state⁷. The behaviour of Chinese SOEs is also becoming more modern and effective in a number of areas, including their ability to attract top executive talents (Dodson (2008)).

In China as elsewhere, R&D expenditure is positive and significantly correlated with firm productivity. The contribution of government R&D to firm productivity works mainly through an indirect channel, via the promotion of firms' own R&D, which appears to be a more effective policy tool than direct R&D grants. Other key sources of production improvement and innovation growth are each firm's absorptive capacity, the production network, openness, and managers' education. Market-oriented, competition-enhancing innovation system reforms are improving the effectiveness of the incentive structure and fostering S&T linkage activities. With respect to the impact of ownership type, SOEs perform worse than collective and private firms in terms of production performance, but not in terms of innovation capabilities (Guangzhou Hu (2001), Guangzhou Hu and Jefferson (2003), Motohashi and Yun (2007)). The choice of innovation types among Chinese SOEs depends on the turbulence in the environment, and on the organizational resources, with market forces and internal governance simultaneously influencing SOEs' innovation patterns (Li, Liu, and Ren (2007)). In many SOEs, managers apply the technical innovation audit tool for benchmarking, thereby improving their ability to choose among different types of innovation mechanisms.

Due to the influence of the two main stakeholders (government and end users), firms with a higher degree of government involvement and a correspondingly lower degree of openness to the market exhibit a more widespread use of innovation mechanisms, thereby apparently contradicting the positive relationship between market focus and innovativeness traditionally posited by "Western" innovation management theories. Therefore, "entering an open market abruptly may not be the solution for SOEs, which are rooted in a socialist economy, to become more competitive and more innovative" (Ren, Krabbendam, and de Weerd- Nederhof (2006)). SOEs tend to prioritize the fulfillment of administrative tasks and "empire building" ventures, whereas non-state firms tend to be more profitable in the market (Li and Xia (2008)).

With the term "empire-building", Li and Xia refer to SOEs' managers' propensity (which they attribute to "agency problems"), to pursue "long term investment and meeting new product output target, at the cost of high level of slack and inefficiencies..." (p.41). SOE's managers are "less concerned with the lack of legal protection of property right. Thus, compared with their non-state counterpart[sic], they are relatively more likely to invest in projects with a longer payback cycle" (p.45). This

phenomenon is due largely to strong government interference in SOEs' behavior, in a context of relatively weak IPR protection. The government puts a paramount emphasis on long-term investments and makes a great effort to promote technological innovations, targeting them as important indicators of SOE performance and awarding resources to SOEs accordingly). SOEs, rely more on government allocated resources, and therefore tend to perform better in areas that are encouraged by the government, such as new product development. As new product output is an important indicator of SOE performance, SOEs are incentivated to operate at the frontier of new product development (Li and Xia (2008) ,MOST, 2005).

In our view, in spite of the relevance of static inefficiencies and distortions, SOEs' behavior in the static sense can be associated with dynamic advantages in terms of innovative capacity and technological progress, with major spillovers benefiting the national economy as a whole. One also needs to take into account the existence of virtuous synergies with the non state-owned sector.

Notwithstanding China's NIS's remarkable strengths, remaining challenges are formidable. For instance, Wang (2006) identifies a dualistic pattern in China's technological development, with the export-oriented segments of the economy being relatively isolated from those producing mainly for the domestic market. Zeng and Wang (2007) stress the weight of constraints such as an insufficiently developed institutional framework, relatively low overall educational attainments, the lack of a large pool of world-class talents, the embryonic stage of indigenous innovation capacity, and insufficiently developed linkages between R&D and industrial enterprises. Other researchers point towards China's persistent weaknesses in technological cooperation between universities and industry, the inadequate integration of the country's China's NIS into the global innovation networks, and the need to develop a comprehensive , more refined technological strategy in order to achieve effective technology transfer from foreign technological leaders, while at the same time maintaining an appropriate balance between indigenous innovations and technology imports (see Li-Hua (2007), Haiyan, Yuanlong and Kaiyuan (2006), Li-Hua and Simon (2007)).

4.2 Evidence on China's innovative capabilities

5.2.1. Indirect and comparative evidence on China's technological progress

Growing quantitative evidence is becoming available on various aspects of China's economy, institutions, and innovative capabilities, and they broadly converge towards suggesting that China is in fact climbing fast the economic and technological development ladder. Figures on economy-wide and industrial GDP, export, and labor productivity growth are too well known to be worth mentioning here. S&T, R&D and high-tech trade indicators are discussed in Section 3.2. Various other sources mention statistics bearing indirect evidence of China's growing technological power. Fortune's 2007 list of the top 500 global corporations includes 24 Chinese firms, four more than in the previous year. This figure is still far from that of US global

companies (162), and also quite lower than Japanese, French, and German companies, but it's higher than the number of Korean, Indian and Taiwanese companies (Yoshida 2007). Intriguing comparative evidence on companies' productivity growth and propensity to innovate appear to show that Chinese firms are doing reasonably well, European firms are maintaining their positions and (surprisingly) US firms are losing ground (see Suh 2008). Productivity growth in China is more than three times the rate of that in the US and Europe. A survey carried out on more than 500 chief information officers (CIOs) in the US, Europe, and China provides even more striking results. Only 32 % of US executives and 41% of Europeans said they wanted to be early adopters of new technologies, compared to 70% of Chinese CIOs (Mayberry, Wang, and Suh 2006. see also Accenture 2007, 2008). Consistently, 70% of companies in China are committing most of their business to web services, against 42% in Europe and 38% in the US: "As companies use these new standards for communicating with other systems, people and companies, they cut manual business process costs to one-tenth of current levels and can flexibly change features and services in less time for substantially less money.... Newer systems, during this second wave of web-based innovations, outperform older technology. These technologies have improved substantially in the past five years, making them easier to implement. As a result, more business processes will be online, driving higher levels of productivity" (Suh 2008). Moreover, many indicators on productivity, revenue and profit growth show that US companies are doing significantly worse than what conventional data on productivity growth might suggest. Among US S&P 500 large companies, employee growth was faster than both revenue and profit growth in 2001-2005. Thus, the growth of average revenue gains per employee was 58% lower than total average revenue growth, and profits per employee growth were only 75% of total profit growth. In contrast, among US S&P 350 companies recorded revenue and profit growth rates higher than employee growth rates. Further indirect evidence of major advances in the areas of governance, management, and technology in China's industry is provided by the very marked improvements in SOEs' economic and financial performance. In the aftermath of the 1997 Asian financial crisis, China's SOEs sector, long plagued by the traditional deficiencies common to most publicly-owned productive enterprises, saw its average profit margins fall close to zero, with many firms reporting big losses. The prevailing wisdom, even among many Chinese observers, was that "since good performance does not guarantee that the incumbent manager will stay long, the manager does not have long-term incentives.... these built-in problems of state ownership cannot be solved by state-dominated corporatization... To ensure that only high ability people will be professional managers and that managers can be well disciplined, the authority of selecting management must be transferred from bureaucrats to capitalists. This calls for privatization of both state enterprises and state banks" (Zhang 1998).

After ten years of restructuring, which implied a dramatic decrease in employment and in enterprise numbers but also massive injections of capital and technology and a major leap in managers' and workers' education and skills, the SOEs sector is in good financial health. In 2007, the profits of the core 152 firms controlled by the central government was about Rmb 1000 bn (USD 140 bn), more than 30% higher than in 2006

and over 200% higher than five years earlier. The rate of return was 11.7%, 1.3% higher than in 2006. 139 enterprises (more than 90 percent of core SOEs) increased their profits year-on-year... period, and 18 of them recorded profits of more than 10 billion Yuan, against 14 a year earlier" (Chinaview 2007). Shipbuilding, automotive and shipping enterprises are becoming significant profit earners, along with petroleum, power generation and telecom companies. In this respect, there is a sub-sector that of cellular phones, where Chinese enterprises might soon achieve global leadership, thanks inter alia to their unique technological change pattern. Domestic producers' competitiveness in the world's largest cell phone market has been buoyed by the Chinese government's October 2007 decision to eliminate all licensing requirements to manufacture and sell mobile phones in the country, thereby opening the gate for newcomers, some of which have been selling phones in the black market. Differently from Japan, which has been quite innovative in the past but mainly produced models sold only in the local market, China is presently using the same technologies as the rest of the world. This important difference could induce Chinese manufacturers to launch fast-forward innovations with the goal of increasing their domestic market share, thereby ending up producing phones that will be competitive (ex post) also in foreign markets.

New Chinese brands are making progress in the areas of brand name, research and marketing development, and appear on the way to close the gap with foreign brands. They might be particularly successful in the huge and fast-growing rural market, Rural customers are more price-sensitive than in the cities and "do not have strong brand loyalty, so they buy things which can give them the best value. To cater to such values, home-grown brands pack more features into their phones, making people think they can get more value from these products... Among the new entrants of home-grown handset vendors; Beijing-based Tianyu is a rising star. It expects to sell 13 million mobile phone units in 2007, a 113.1% growth year-on-year to become the third biggest domestic handset vendor in China. ..." (Chung 2007).

Other strong and innovative firms are CECT (which has launched a model with biometric security features) and Meizu. These companies "seem to be building up a global customer base attracted by the feature sets of the phones, which aren't provided by the global brands.... It's also pretty inevitable that there will be a breakthrough product, one that just happens to meet an unexpected demand, and that will really bring Chinese phones to global attention" (Trigram.wordpress.com 2007).

In sum, China is trying to create a group of large leading SOEs in highly competitive sectors, where technology, design and marketing capabilities are key for ultimate survival, thereby overcoming a traditional weakness of public enterprises worldwide (Dyer and McGregor (2008). The ultimate outcome of this major upgrading and restructuring exercise in China's public industry will clearly play a crucial role in shaping the country's development model.

4.2. 2. R&D and S&T indicators

Input indicators show that China not only earmarked huge and ever-increasing resources towards research, science, and technology, but also intensified its efforts in relative terms, thereby exposing a strong and effective pro- R&D and S&T bias in both government and business sector policies (See Table 1). Gross Domestic Expenditure on R&D in nominal terms almost tripled (in nominal terms) in the early 2000s, reaching 300 bn Yuan by 2006. In a period of very fast economic growth, the GERD/GDP percentage ratio also increased markedly, from .95 in 2001 to 1.42 in 2006. This figure is beginning to approach the 2% benchmark which is commonly considered a rule-of-thumb indicator signaling that "a country is sufficiently technologically sophisticated to help ensure technology-led economic growth." (OECD 2007). The business sector is the main contributor to total R&D expenditure (almost 70% in 2006), with most of the remainder being provided by the government. Sector-wise, over 70% of China's R&D is carried out by the business sector (which also employs almost 2/3 of the country's R&D personnel) and about 19% by research institutes. 70% of China's R&D workforce focuses on experimental development, 20% on applied research and almost 10% on basic research.

Roughly a half of total R&D is concentrated in the manufacturing industry, representing about 2% of its total value added. However, the latter indicator is more than twice as much in the high-tech industries, and reaches almost 14% in the aircraft and spacecraft sub-sector (see Table 1.3). Government S&T appropriation reached 168.8 bn yuan in 2006, more than twice the corresponding figure for 2001. Government S&T appropriation also increased as a percentage of total government expenditure (3.7 in 2001 to 4.2 in 2006), with a high level of priority being accorded to special projects and operating funds. S&T personnel reached over 4 million and R&D personnel (mostly scientists and engineers) 1.5 million.

Patents granted by SIPO (State Intellectual Property Office of the People's Republic of China) in 2006 were almost 270,000, more than twice the corresponding figure for 2002 and six times that of 1996. Over 22,000 patents were granted to Chinese nationals (up from about 17,000 in 2005) and 44,000 to foreigners. However, most domestic patents were granted for utility model and design innovations. In the subset classified as true "inventions", successful foreign applicants outnumbered Chinese nationals, although the share of invention patents granted to the latter (43%) increased from that of the previous year (39%). Over half of all domestic service invention patents were generated in the business sector.

China published over 400 thousand S&T papers in 2006, almost twice as much as in 2001. More than half were produced by universities, but the fastest rate of increase was recorded by publications stemming from medical institutions. Chinese S&T papers indexed by SCI, EI, and ISP were 172 thousand in 2006, almost three times more than in 2001. The share of Chinese S&T papers indexed by the main international specialized institutions also rose significantly, reaching more than 42% by 2006.

China's high-tech trade expanded at an extremely fast pace. Exports increased twenty-fold in 1996-2006 period, reaching 2.8 USD bn by the end of the period. Their relative weight also rose, and by 2006 it had climbed to about 30%, both with respect to manufacturing exports and to total exports⁹. High-tech imports increased at a slightly slower pace, and as a result the high-tech trade balance turned positive in 2006 for the first time (see Table 3.1.). China's high-tech trade is heavily concentrated on the computers & telecom sub-sector, with over 2.2 bn exports and a 1.5 bn surplus in 2006.

Available, simple international comparative indicators of R&D inputs and outputs confirm the basic features of an overall scenario in which China has undoubtedly joined the worldwide Ivy League, pouring towards the research sectors enormous and ever-increasing human and financial resources. China's R&D effort far outpaces that of other large, semi-industrialized countries such as Brazil and India, is far ahead of many countries formerly seen as among the most industrialized ones, such as Italy. However, they also show that China still lags behind the US and the other members of the small group of world technological leaders in the most advanced areas. In terms of R&D intensity of the national economy, measured by the GERD/GDP percentage ratio, China has clearly left behind Italy, Russia, Brazil, and India, but still lags behind the four world R&D leaders: US, Germany, Japan, and Korea. The two Asian countries, in particular, lead the field in terms of R&D intensity with GERD/GDP ratios close to or larger than 3%, more than twice China's ratio (Table 4.1.). Data on the distribution of GERD resources confirm the findings reported in para 3.1., above, i.e. that China's R&D activity - consistently with its present level of technological development - is much less focused on basic research than that of any other major player, including Russia. The absolute size of China's personnel army (over 1.5 mn) far outnumbers that of any other country, yet in relative terms (R&D personnel per 10,000 labor force) it is less than one tenth that of Japan, Germany, and even Russia.

In absolute, nominal (i.e. dollar-denominated) terms, China's Gross Domestic Expenditure on R&D appears to be only slightly over one tenth of that of the US, one fifth of that of Japan, and half that of Germany (still, it is over four times higher than Russia's and Brazil's). However, in this case the MOST data, albeit formally correct, are misleading, as they might induce to unduly underestimate China's true strength vis a vis the rest of the world: "While the dollar figure on China's R&D spending is dwarfed by that of Japan and the U.S., the real value of its expenditure is higher, thanks to lower costs - putting China third globally, on the basis of purchasing power parity" (HIKPA 2006). In fact, the international R&D expenditure figures expressed in purchasing power parity (PPP)¹⁰ estimated by the OECD terms show a dramatically different picture. Having been growing at an exceptionally high annual rate of over 20% (more than five times that of any other major industrial country), China's R&D expenditure reached 136 bn USD in 2006, the second largest in the world, surpassing that of Japan and equivalent to more than one third that of the US. Basic comparative indicators of international R&D outputs appear¹¹ to show that China - having reduced rapidly its relative backwardness, especially in the early 2000s - figures among the global leaders, as it ranks 4th worldwide in terms of domestic invention patents granted, 2nd in terms of

indexed papers published, and 5th in terms of SCI-indexed papers published . These data, however, are not adequate to provide firm evidence on a much-discussed issue, i.e. whether China's ability to translate R&D inputs into output is structurally lower than that of world technological leaders.

4.2.3. Accumulation, Relative Surplus Value and Technical Progress

Felipe et al. (2008) apply a Classical analytical framework to analyze in a comparative fashion the diverging patterns of capital accumulation, profit rates, investment rates, capital productivity, and technological change of China and India between 1980 and 2003. Their findings can be propaedeutic to a deeper discussion on the relationship between China's pattern of economic development and its unique socioeconomic structure.

China's accumulation process has been much faster than India's, thanks to China's investment rate (i.e., investment/GDP ratio), due in turn mainly to the fact that China has been reinvesting almost all her surplus, while India invested a much lower share.. In fact, as a World Bank study has recently pointed out, corporate sector saving – including by SOEs – is a key contributor to China's high rates of saving and investment: "At about 20 percent of GDP – double the share in the U.S. and France – retained earnings finance more than one-half of enterprise investment." (Kuijs, Mako, and Zhang 2005, p.3). Another important, and apparently contradictory finding, is that profitability has been rising constantly in India, but declining in China, so that the profit rate was much higher in the latter by the late-1990s. More worryingly, capital productivity¹² declined in China, while it rose in India¹³, and - consistently - technical change was "Marx-biased" (i.e. of the labor saving, capital consuming type) in China, while it was broadly Hicks-neutral in India.

In sum," India differs from China in terms of how much profit has been plowed back into investment. In China virtually all profits are reinvested, with the consequence that actual investment has outstripped the capacity provided by profit and has led to the creation of overinvestment and overcapacity. Why is so much profit reinvested in China? A large part of these profits come from State Owned Enterprises. These companies do not pay dividends and face incentives that are biased toward investment, as local officials are promoted largely on their success in generating economic growth, which comes through investment. Thus, a large part of these profits is used for capital expansion (as much as 20% of all investment in China comes from local governments) without efficiency considerations..." (p.752). The policy - initiated in 1994 - of non-payment of dividends was initially justified by the feeble and declining profitability of public enterprises, and by the need to recapitalize SOEs in the framework of a deep reform process aimed at streamlining and strengthening state industry, but by the mid-2000s it had been made obsolete by its own success. Actually, " The current non-payment of dividends implicitly assumes that there is no better use of SOE profits other

than re-investment back into SOEs. Clearly, however, China faces urgent challenges in refocusing its public spending to improve key services. " (Kuijs , Mako and Zhang, 2005, p.7)¹⁴. It is also clear that, as a result of this policy, SOEs have been investing more than they would have had otherwise. The Chinese government has acknowledged this problem¹⁵, and began in 2008 to enact a cautious and still experimental policy change, collecting a modest (5-10%) share of the profits of state firms under its direct control. The destination of these dividends has not been clearly specified yet, but they are expected to be channeled to both social consumption (i.e., financing social security funds) and investment in high technology sectors (see China Daily 2007, China.org.cn 2007, Shanghai daily (2007), Naughton 2008). This development surely goes in the right direction, but is still probably insufficient even to achieve the simple goal to curb excessive investment (see Chan 2007).

Felipe et al (2008) attribute their findings largely to India's unfavorable institutional investment climate, and to China's bureaucratic push towards wasteful and inefficient investment. SOEs' bias towards wanton and inefficient expansion of investment, in particular, appears to constitute a major weakness of China's economic system. In our view, however, it is also important to see this issue in another perspective. Following Gabriele and Schettino 2008, we introduce the term "socialistic". Assume, as a mental experiment, a theoretical continuum of conceivable mixed socioeconomic systems, where on one hand there is a pure free-market, private-property based model of classical capitalism, and on the other hand a fully publicly-owned, centrally-planned socialist model. In this theoretical framework, the term "socialistic" indicates the property of being characterized by crucial systemic features in the domain of ownership, class, and other social relations of production and exchange which are relevant enough to position a specific socioeconomic formation rather strongly towards the socialist side.

Our reasoning is crucially based on a proposition which we consider relatively self-evident stylized fact, but which by its very nature cannot be demonstrated formally. The important differences in the patterns of accumulation and technical change found in the two Asian giants are in turn the product of another key difference, which is stemming from the very structural nature of their respective socioeconomic formations. Simply put, in India, but not in China, there is a full fledged capitalist bourgeoisie structured and organized as the dominant class¹⁸ (see, for instance, Tsai 2008). Thus, China can be considered as one of the two presently existing members of a very small club that of a market-socialist or "socialistic" countries. India, conversely, is a "normal" capitalistic country.

A very important corollary of this crucial systemic difference is that the share of surplus which finances the bourgeoisie's conspicuous consumption in "normal" capitalistic countries is virtually non-existing (or more precisely, carries a much lesser macroeconomic and strategic²¹ weight) in China, and almost all the profits are reinvested.

In a capitalistic economy, the shadow price of potentially investible financial resources in the framework of a long-term social welfare function to be maximized by policy-

makers is likely to be lower than private capitalists' implicit discount rate. Therefore, taking for given the wage rate and hence workers' consumption²², there would be room left for other investment projects, which would imply a relatively low but still positive rate of profit. Thus, it is usually the case under "normal"²³ circumstances that the actual share of invested surplus in a capitalistic economy is lower than the one which would be optimal from a long-term social welfare viewpoint²⁴ (See Appendix).

What happens, conversely, in an economy that is "socialistic", even if only in a weak sense, such as China, where the state is strong enough to effectively command (via direct appropriation and/or via institutional, administrative, legal, and informal mechanisms) the allocation of a major share of the surplus? *Ceteris paribus*, a country with such "socialistic" characteristics should invest a share of the surplus higher than that of a capitalist country. It is reasonable to argue that this is in fact the case in China - largely because a large share of total profits is earned by SOEs²⁵, which are mandated by the state to pursue a number of objectives different from profit maximization, among them investment expansion.

According to our view, therefore, a socialistic society can exhibit a lower marginal productivity of investment than an otherwise similar capitalist one, and still exhibit an overall superior behaviour with respect to the determination of both the quantity and the quality of national investment.²⁷ Whether this is in fact the case or not depends on the specific characteristics of the institutional framework shaping investment decision in a concrete socialistic economy, and can only be analyzed empirically on the basis of available data. Going back to the China-India comparison, it is known that the share of surplus that is plowed back to investment (which could also be called the investment/surplus ratio) is higher in China than in India. How much of China's additional (with respect to those which would be channeled towards capital accumulation in India, or another "normal" capitalist country) investment resources are rightly earmarked towards socially profitable projects - resulting in a lower marginal and average productivity of investment, but in a better long-term allocation of resources - and how much are totally or partially wasted?

A related but different question is as follows. The recent decision to let SOEs start paying a significant (even if still very small) share of their profits as dividend to the state is to be welcome. The destination of these dividends is still not very clearly defined, as there would be good economic and social reason both to earmark them to social consumption and investment (e.g., public health care and education), but also to keep prioritizing investment in infrastructure, key high-tech sectors, and R&D. Given the suboptimal state of China's basic public services, and the very long-term unsustainability of an already very high and permanently rising investment rate, it is plain that a high degree of the priority in the short term should be accorded to enhance social public consumption and investment.

In the long term, however, assuming a stable and sustainable rate of accumulation is achieved, a more complex issue arises. For any modern socioeconomic formation, it is clear that the only way out of the putative Marxian law of tendentially declining profit rates is not to slow down accumulation *per se*, but to shift progressively more and more

resources towards the development of high-tech and highly productive sectors²⁹ and towards R&D and S&T activities in particular, striving to accelerate the rate of technical progress and to improve its nature.

Actually, the pattern of technical progress should be made less and less Marx-biased, capital consuming in nature, and become increasingly Hicks neutral, or even capital-saving. Such a major drive towards the quantitative and qualitative improvement of technical change patterns must be pursued, at least in part, independently from a key price-based signal such as the expected market-measured profitability of individual investment projects, in a market-compatible framework based on a modern and advanced form of planning. We refer to a form of resource allocation where a significant share of aggregate investment is allocated according to shadow prices based on a long term socially-oriented planning framework. This framework should internalize to the maximum possible extent those needs and externalities which do not stem from the price structure emerging spontaneously from the market - i.e. the "real" long-term social value of education, health, the environment, R&D itself, etc. An important component of this overall planning framework might be an embodied mechanism to shape in a dynamically optimal fashion the evolution of the price structure itself.

5.3. Opportunities and Challenges: from NIS(National Innovation System) to SCENIS?

What are the opportunities and challenges that China faces in innovation and how can it ---if at all possible--- move from what looks like a capitalist innovation system albeit with a large state sector towards a socialist SCENIS?

Since the late 1990s, the Chinese Government has approved a number of crucial strategic decisions to build up a world-class National Innovation System, seen as " a networking system composed of institutions involved in knowledge innovation and technology innovation (which)... includes the following: knowledge innovation system netted with the state research institutions and key universities; technology innovation and technology application system with industrial enterprises; knowledge dissemination system with schools and universities. In 1998 the government instructed the Chinese Academy of Sciences (CAS) - a vast network of research institutes that are presently undergoing feverish expansion and reorganization – to initiate the Pilot Project of Knowledge Innovation Program (KIP)" (CAS 2008). An action plan was carried out for rejuvenating education in the 21st century, in addition to a national meeting on technology innovation and a working conference on basic science research, in order to further enhance the reform of the scientific research system. Plans are also drawn to open a second-board stock exchange in the securities market, similar to the American Nasdaq. The KIP piloted at CAS is a major component of the National Innovation System (see CAS 2008).

In January 2006 China launched the “National Medium- and Long-Term Program for Scientific and Technological Development” (2006-2020), commonly known as the 15-

year Plan for science and technology. The Plan's long-term goal is to allow China to become a pre-eminent global economic and technological power, relying on "independent, indigenous innovation":³¹ "By the end of 2020, we should establish an improved scientific and technological innovation system. . . We will strive to leapfrog the development of China's information science and technology and to acquire core technologies with proprietary intellectual property rights in the IT sector." (Quoted in AeA 2007).

Not all the details of the plan were made public, but its main tenets are clear. China is foreseen to raise R&D spending from the current 1.4 percent of its economic output to 2 percent by 2010 and 2.5 percent by 2020: "these commitments would put Chinese R&D investments above \$100 billion annually, placing it in the same league as Japan and the United States (RTM 2007). Acknowledging that China's high-tech industry is growing fast but is still largely dominated by multinational companies and centred on low-value-added, labor-intensive manufacturing, "the 15 Year Plan intends to change that equation by investing heavily in such cutting-edge areas as nanotechnology and biotechnology to spawn indigenous innovation." (RTM 2007). Table 5 The 15-year Plan's 12 priority sectors

- Advanced Storage Technologies
- Alternative and Renewable Energies
- Biotechnology/Genetics
- Electronic Components
- Environmental Technologies
- Integrated Circuits/Semiconductors
- Manned Space Exploration
- Materials Technology
- Nanotechnology
- Network and Communication Technologies
- Optical and Biological Computing
- Software and Related Services

Source: AeA 2007

According to American Electronics Association (AeA), which carried out a synthetic assessment of the plan in 2007, (AeA 2007), the Plan's goals are ambitious, but not unrealistic³². China has a leadership mainly composed by engineers, who are in a favourable position to understand the nature and the strategic centrality of research and technology, and has already built up remarkable elements of strength in the S&T and R&D area. For instance, it has been pouring huge societal investments into higher education and research (state financing for higher education more than doubled in 1998-2003, reaching over USD10bn by the end of that period; China's number of researchers increased by almost 80% in 1995-2004, and is now second only to the US). Large SOEs are also investing heavily in technological upgrading and human capital formation, and there are a number of start-up innovative firms, some of them already established in

international markets (such as Lenovo, Haier, and Huawei), and others active in crucial areas such as the provision of Internet services for the domestic market.

Yet, China also faces a number of challenges. Its high-tech industries are growing extremely fast, but they are mostly owned by foreign TNCs and still usually concentrated on low value-added stages in the value chain. In this respect, AeA (2007) quotes Daniel Rosen, a senior researcher in the Institute for International Economics, who half-jokingly remarked: "China's high-tech exports turn out not to be so very high tech - nor, indeed, very Chinese." Another key area of concern is constituted by weak IPRs protection - although the AeA rightly notes that the Plan acknowledges that China's own development interests are already shifting in favour of strengthening the IPR protection regime, and calls for action in this domain. AeA (2007) argues that it is also urgent to take decisive measures to reform capital markets, encourage risk taking, and let ideas flow more freely, to stimulate truly innovative thinking and research. To our view, many of these challenges are in fact crucial - a significant exception being, probably, capital market reforms. However, it is not straightforward that the remedies should always go in the direction of following the US model (as AeA appears to suggest), taking into account the strong arguments in favour of fostering a smooth reform path towards a specifically Chinese NSI consistent with the country's history and its market-socialist socioeconomic system (see, for instance Liu and White (2001), Keun Lee (2006)).

Finally, it is important to locate China's 15-year S&T Plan in the framework of the worldwide scenario shaped by the converging trends of key frontier technologies. As the APEC (2005) workshop on this topic has made clear, the convergence of information technology, biotechnology and nanotechnology (the so-called superconvergence) might be the most significant technological event of the 21st century (see Khan 2005). The process of convergence is already underway. All the major national and regional players including USA, EU and Japan have already taken significant steps in order to maintain and gain further advantage in these technologies. China is a latecomer.

What can China do in order to be in the same league as the three major players mentioned above? Taking into account the challenges posed by a very competitive international environment where the other major players still hold a significant advantage, China can achieve super convergence only through the creation of a self-sustaining innovation system that can move forward over time. This paramount strategic goal must be properly seen as the logical evolution of the present S&T strategy, basically centered around perfecting China's NSI, towards a qualitatively superior, self-propelling innovation system. The 15-year Plan, if successful, will complete the catch up process by 2020. Between 2020 and 2050, the strategic goal should be to build up autonomously advanced technological capabilities in the three crucial areas, with a view towards moving towards super convergence. Regional cooperation with Japan, Korea and Taiwan can play an important role in this strategy. Ultimately, a Pan-Asian regional innovation network including India and the ASEAN countries might also be established. China's National Development and

Reform Commission (NDRC) can start the process of national capacity building and regional cooperation by supporting key strategic ventures. Increasing the number of competent staff in the areas of planning for high technology development should be given serious consideration. In Khan (2008a,c, 2004a, 2002,1998) the overall planning framework is presented as part of a system-wide effort to create a positive feedback loop for innovation, which is at the same time distributionally progressive, equitable, and environmentally sustainable. The term used here to refer to such a mechanism is that of nonlinear complex innovation system, or SCENIS. (see Appendix 2). The SCENIS framework can be applied through quantitative economy-wide modeling techniques, in order to analyze the challenges for transition from now to 2020 and then from 2020 to 2050.

The SCENIS approach is based on a somewhat novel theory of innovation in the economy wide setting. Its first and most important feature is that the analysis of a SCENIS can be thought of as part of the institutional turn in economic theory. However, in contrast with much institutional literature, its propositions can also be expressed in a formal language, through models that can be estimated quantitatively for both rigorous, empirical scientific testing and for policy making purposes. The starting point of the SCENIS theory is the creative destruction process at the firm and industry level. However, an extension to an economy-wide setting requires the explicit theorization of the role of the state as well as an interacting nonlinear market process. The direction in which the theory leads is a complex interaction between state policies and market processes that influence the decisions taken by specific firms in particular areas of innovative activities. The key concept that is developed in this context can be called a Managed Creative Destruction (MCD) process. In a national (or regional) MCD, the creative destruction process characterizing innovation is structured more consciously by the state (or the states in a particular region). It can be argued that China is now going through this process. Following Schumpeter, we assume that innovation in specific firms can have economy-wide effects. As models based on this approach have multiple equilibria, the concept of a Complex sustainable capabilities enhancing innovation system or SCENIS is formalized by picking an appropriate sequence of equilibria over time. It can be also shown that SCENIS has empirical relevance by applying the formal model to an actual economy. Ultimately, technological transformation — in particular the creation of a SCENIS - is what makes the difference between sustained growth and gradual or sudden decline.

In addition to the system wide approach to innovation over time, the SCENIS theory offers two other distinct advantages. One is the linkage between micro and meso or macro levels. One can start with firm level data on innovation activities and link these to sectoral and intersectoral information flows. In this way, what happens at the firm level can be seen from a larger, economy wide perspective. At the same time, the impact of firm level activities on overall level and pace of innovation can also be ascertained qualitatively and quantitatively.

The third aspect of SCENIS is distributional. Since the complex system dynamics of SCENIS is holistic, it integrates production with distribution. Thus the distribution of

value added in production at both the factorial and household levels can be formulated as part of a general equilibrium (or, under circumstances of internal or external shocks, disequilibrium) frame work. Given the levels and distribution of income among households, the consumption patterns and effective demand feedback mechanisms complete the formulation of a system wide model.

While acknowledging the impressive progress achieved so far, a comprehensive recent OECD study on China's innovation system (OECD 2007) concluded with a sobering warning: "China needs a better return on its fast-rising investments in research and development (R&D) and higher education if it is to meet its goal of becoming an 'innovation-oriented' economy by 2020...China still has along way to go to build a modern, high-performance national innovation system." This statement is realistic, as it stresses the uncertainties of the future without underestimating Chinese government's firm strategic determination to achieve the 15-year Plan's goals. China's leadership seems to be fully aware of the centrality of science and technology, not only for economic growth, but also with respect to other crucial challenges, such as the ultimate environmental sustainability of its market socialist development model³³ and for the sake of enhancing China's relative place among the world leading nations. Consistent with this goal, it has been earmarking towards research and the broader S&T sector an increasing share of China's fast growing GDP. As a result, China has now achieved a substantial critical mass in the area of research and innovation, second only (according to some estimates) to that of the US, and growing four times faster than that of any of the major world technological leaders, among which there are signs that the enthusiasm for ever increasing investment in R&D might be somewhat declining, both in the public and the private sectors. There is by now plenty of evidence showing that over the last decade China has witnessed major efficiency-enhancing institutional and organizational changes, including in the area of property rights, a massive accumulation of human capital, and a very sustained rate of scientific and technical progress. Labor productivity has been rising fast, and a major part of the improvement is likely to be due to the aforementioned factors, even taking into account China's extraordinary rate of non-human capital accumulation. R&D input indicators and output indicators such as patents and scientific papers have been rising fast. Yet, a closer look shows that China is doing an excellent job at absorbing, adapting and developing existing technologies, but is still lagging significantly behind world technological leaders in terms of capability to generate state-of-the-art, world-class innovation proper, as is shown for instance by data on basic research and inventions patents.

With respect to state industry, the assessment of available evidence on SOEs' performance is more complex. Most sources indicate that, until the end of the past century, SOEs had been absorbing a major share of investment funds while exhibiting efficiency and profitability levels lower than enterprises belonging to other forms of ownership. Yet, their propensity to innovate (not always in an effective way) was high, and their productivity climbed dramatically, especially during the late 1990s. Latest available evidence appears to show that, during the present decade, the policy of concentrating huge resources on a small number of large and advanced SOEs, while letting smaller and less efficient state enterprises to fend more or less for themselves (

recurring increasingly to extreme measures such as closures or ownership changes) has begun to bring significant qualitative fruit, as testified by core SOEs' increasing profitability and international competitiveness and by the embryonic emergence of some world-class state-owned TNCs. Both SOEs and large industrial enterprises operating in China under different forms of ownership - such as joint ventures and private (national and foreign) firms - manifest a very strong willingness to innovate, at a time when their counterparts in the US and - to a lesser extent - other OECD countries appear to show a sort of innovation fatigue. The economic sustainability of China's historically unprecedented S&T effort does not presently appear an issue, at least in the short-to-medium term, taking into account the leadership's determination in prioritizing the S&T sector and the resilience of China's GDP growth rates, even in presence of diverse unfavorable exogenous phenomena such as the Sichuan earthquake and the overall slowdown in the international economy triggered by the US subprime crisis.

As a result, China's NIS is undergoing major quantitative and qualitative changes. The latter are those which bear the most crucial weight. The main features of the 15-year plan appear to show that the basic tenets of the two-pronged S& T strategy outlined in Gabriele (1992) still hold. On one hand, the relationship between most R&D activities and the market is becoming closer and closer. Most of the R&D is already being carried out inside the enterprise sector, while universities and research institutes are intensifying their contacts with firms, and generating themselves start-up ventures to develop, produce and commercialize their innovations. The IPR protection system, in particular, is evolving towards a higher level of protection, partly to respect China's WTO obligations, but mainly to suit the present development stage, characterized by an increasing degree of commercialization of the bulk of technological knowledge (essentially, the one stemming from applied research and development activities). On the other hand, in order to tackle the crucial weaknesses mentioned above, vast financial, human and institutional resources are being channeled towards a long-term basic research endeavor, concentrating on a limited number of strategic high-tech sectors. This major effort is articulated institutionally in a decentralized fashion, yet operates in a broadly consistent organizational and financial framework set up as a key component of China's specific form of strategic development planning.

The challenge, at the present stage, is to engineer in a relative short period (10-15 years) a decisive qualitative leap in China's NIS, developing a systemic ability to generate world-class indigenous innovations. In addition to generating technical progress, China's development strategy shall also take into account the challenge of establishing a model of innovation compatible with an equitable pattern of income distribution and environmental sustainability, thereby paving the way to the eventual evolution towards a higher and more developed form of socialism. This is the expressed aim of the Chinese leadership, and also enjoys considerable popular support.

However, the conventional NIS approach does not include a set of social and other informational requirements which are crucial to policy makers in order to steer successfully such a complex transition. Therefore, there is a need for more advanced analytical and planning tools. In this respect, we briefly refer to one particular

approach, exemplified by the models introduced by Khan (1998, 2002, 2004a,b,c and 2008a,b,c) within the context of nonlinear positive feedback innovation systems or SCENIS. SCENIS can be thought as a generalization of NIS that embodies distributional, ecological and other issues relating to socio-economic (and even political) development.

Therefore, SCENIS-type models are sensitive to many of the abovementioned concerns relevant to the strategy of development in China. SCENIS-type models can be used to chart strategically the market socialist course, as their internal logic is also consistent with China's "walking-on-two-legs" catch up strategy.

Actually, this strategy aims at embodying world-class best practices from technological world leaders and successful late industrializers, but is also uniquely Chinese in at least two crucial aspects. The first is China's sheer size, which has allowed her to leapfrog to rank 2 worldwide in terms of the absolute quantitative magnitude of its NIS, at a stage when it still lags far behind all technological leaders.

5. Conclusions---Beyond the China Model: Limits of Capitalism and Chinese Style Mixture of Capitalism and Socialism----Challenges for Sustainable Industrialization and Development for BRICS and Others

At Doha in the 2012 meeting of UNCTAD, during the ratification of the Accra accord of 2008, the idea of an enabling State became a contentious issue. The neoliberals from the global North wanted a more neoclassical view, calling for an "effective State". Such a state would work with private and NGO sectors in order to "help forge a coherent development strategy and provide the right enabling environment for productive economic activity". The developmentalists wanted to have a more activist state. As is usually the case under such circumstances, the final document was a compromise.

In retrospect, it does appear that the major achievement was the unity of G77 and China and despite the confusing incorporation of both sides of the debate without a real synthesis, the idea of an enabling state survived the political storm. It is up to the progressive scholars to give the idea a more coherent conceptual shape so that it can guide social movements and policies for progressive change in the 21st century. This paper can be seen as an attempt to do this. However, given the ecological crisis and other fractures in the GCO, the choice remains Luxemburgian. In slogan form we can express it with the same urgency as Rosa Luxemburg: in the 21st century, with the looming ecological crisis it will be either socialism or ecological disaster and barbarism. Accordingly, I try to find a way to integrate useful markets in a non-capitalist setting with the key characteristics of the Enabling Developmental State for the 21st Century in order to build a growing ecologically sustainable economy with equity in terms of social capabilities.

In this paper, I have tried to define development a bit more precisely both from a classical perspective and from an Aristotlean-Hegelian-Marxist normative perspective with contributions from Sen and others. In particular, I have asked what people-focused development means. It turns out that answering this question rigorously requires elaboration of Sen's concept of freedom as capabilities in an explicitly social and political direction. Then I proceed to ask what are some of the strategic questions we must ask when we wish to enhance capabilities over time. This leads us to a view of an enabling developmental state that includes many features from the East Asian Developmental State model; but it is crucially augmented by considerations of egalitarian development and the deepening of democracy during the developmental process. These augmentations point beyond capitalism and towards socialism.

The critical discussion of both the East Asian development experience and the Chinese innovation system leads to two conclusions among other things. The first is that these were exceptional cases even under the first phase of the US empire and will be impossible to replicate under the current rules of the game instituted by the US and other developed countries. Therefore, the current rules of globalization must change.

The second conclusion is that even if these rules change and some other countries can move forward on the path of industrialization, the older 20th century modes of industrialization based on fossil fuel based technology will not be sustainable.

As Khan(2009, 2010) demonstrates, even for China the current strategy of development and patterns of energy consumption are unsustainable. In this particular work reported in Khan(2010) , I have sketched the energy dilemma for China in this century in Khan(2010). As long as the current geopolitical situation persists, the pursuit of present development strategy of China will further increase its energy dependence. For both political and economic reasons, China needs to rethink its development strategy. I have sketched such an alternative strategy that relies much less on fossil fuels and emphasizes regional cooperation. In the present essay, I have shown how the NIS of China can begin to move towards an ecologically sustainable SCENIS. This SCENIS strategy will ultimately lead to a sustainable economy based on growth with equity. A transition to a non-fossil fuel based knowledge and information economy will also be easier to effect under the proposed strategy. These lessons are applicable with appropriate modifications to BRICS as a group and with further country-specific changes to many other developing countries as well. But movements away from the current crisis-ridden GCO towards socialism are essential.

The 19th party congress resolution of CPC declares some principles and recommits the party to building socialism with Chinese characteristics. Thus it declares in a key paragraph:

The Congress affirms that the culture of socialism with Chinese characteristics is a key part of socialism with Chinese characteristics and a powerful source of strength that inspires the entire Party and the Chinese people of all ethnic groups to forge ahead courageously. The Congress approves the incorporation of the culture of socialism with Chinese characteristics into the Party Constitution, along with the path of socialism with Chinese characteristics, the theoretical system of socialism with Chinese

characteristics, and the system of socialism with Chinese characteristics. This addition will help all Party members deepen their understanding of socialism with Chinese characteristics and fully grasp its implications. The Congress stresses that all Party members must cherish deeply, uphold long term, and continue to develop this path, this theoretical system, this socialist system, and this culture, which the Party has developed through great hardship; hold high the great banner of socialism with Chinese characteristics; have firm confidence in the path, theory, system, and culture of socialism with Chinese characteristics; and implement the Party's basic theory, basic line, and basic policy. (Xin Hua and Global Times, 2017)

Yet there is no discussion of the ecological crisis, the need for leadership in this area as well as for moving away from what are at best NEP in USSR like policies towards private enterprises and profit. Unless CPC has a clear strategic line on this, no amount of talk about the culture of socialism will lead China in the right direction. Therefore, time is of the essence. Given the path dependence of development, unless strategic disengagement from the existing path followed by a strategic engagement with the alternative strategy is begun within the next two to three decades, it may well be too late. The stakes are indeed very high. A more detailed strategy paper based on the key ideas from the alternative strategy outlined here with concrete quantitative scenarios and feasibility studies along the lines of models sketched in the Appendix (and other, more detailed models) will go some distance towards giving the appropriate analytical foundations for the policymakers. The preliminary results confirm the predictions regarding fossil fuel-based energy shortage and lead towards a serious consideration of alternative energy sources. Achieving the twin goals of energy security and ecological balance are challenging but not impossible for China. Serious policy research can be used effectively if there is the political will to do so. The goal of regional cooperation is also achievable if patient negotiations in good faith can start in earnest. In particular, cooperation with other Asian economies, particularly Japan, Indonesia, Vietnam, and India will be crucial. This paper has sketched out the complexities of cooperation and conflict in GCO. Future work will address the problems of Regional cooperation for China in the East, South, and South Asian context as well as in the context of Africa and Latin America.

Khan et. al.(2009) shows this for the BRIC(South African detailed data was not available for the econometric work) as a group by investigating the relation between rapid economic growth and environmental degradation in the BRIC economies. Utilizing environmental, macroeconomic and financial variables coupled with Kyoto Protocol indicators based on panel data from 1992 to 2004, we can examine long run sustainability. Technically, the long-run equilibrium relationship between economic growth and energy consumption is examined. *Feasible general least squares* procedure (FGLS) is employed to estimate the environmental degradation caused by increases in energy consumption. *Pooled regression analysis* is used to estimate the relationship between energy consumption and growth variables. The impact of excessive economic growth rates on energy consumption levels is studied by means of *threshold pooled ordinary least squares* (POLS) method. Moreover, this analysis takes into account the legitimate econometric criticism of the Environmental Kuznets Curve highlighted by Stern (2004). The findings reveal that higher energy consumption leads to increased CO₂ emissions in the countries under consideration. It is also found that rapid economic

growth further inflates energy consumption levels in the emerging BRIC economies. The results of cointegration analyses also confirm these findings. Finally, the inclusion of the US and Japan as the world's largest energy consumers does not significantly alter the results of our study.

The implications of the study of China's energy and innovation systems and of the long run growth implications of the BRIC economies for environment are quite clear. The crucial question is: what kind of transformations in the global economic environment and development discourse will influence the policies of these economies in the right direction. A related question is: how can the larger economies of the world play an enabling rather than a predatory role in furthering sustainable industrialization and development in all the countries including the LDCs? It is clear that the turbulent and crises-ridden GCO is not sustainable.

In addition, two further corollaries follow logically from the identification of both the necessary as well as the more contingent factors that have played a role in East Asia, and our additional crucial strategic factors egalitarianism and deepening of democracy for the 21st century enabling developmental state and a strategy for development as freedom. The first is the need for taking a historically grounded pragmatic and diagnostic approach to the technical problems of development on the one hand. The second is that at the same time we must make democratic deepening and egalitarianism the strategic centerpieces of any progressive social movement. It is important to make these last two factors the most salient identifying criteria for an innovative Enabling Developmental State that integrates useful markets with developmental objectives to increase the capabilities. It is at least theoretically plausible that in practice opportunities for implementing such a strategy with further ongoing learning will arise as a result of struggles from below that are unfolding.

It is necessary to identify distortions from the perspective of deepening democracy and egalitarianism and correct these quickly. It is also equally necessary to identify market failures and other institutional failures. Instead of taking a grand, presumptive approach to development, the role of a mix of heterodox policies with the willingness to revise policies before the cost gets too high seems to be the best recipe for avoiding failures. However, compromising on democracy and egalitarianism will be strategic mistakes. Therefore, the people's movements must avoid these even if it means slowing down growth within acceptable limits for some time. In general, with careful participatory planning and implementation, deepening of democracy will not conflict with growth and other goals of development.

Clearly, in order to promote equitable growth and broad development we must build institutions that can supply social insurance and safety nets, and create a democratic space for voice and accountability. But there is no one-size-that-fits-all for any of these functions.²¹ Here the role of history of popular movements and institution building will be crucial. While movements in different parts of the world can certainly learn from each other and have ties of solidarity, each part will need to have specific strategic

²¹ See Chang (2007) for a number of thoughtful contributions on this topic among other things.

orientation and tactical and and strategic organizational forms for both building the movement and building the egalitarian and democratic institutions in every sphere according to its particular historical trajectory. No predetermined futures are foreordained in this complex 21st Century world.

But it must be admitted honestly that the GCO which has been crisis-ridden by its own contradictions throughout its history, has now created an additional, and under its own terms, an irreversible ecological crisis. The only sustainable future for human civilization is ultimately a noncapitalist world which is not the same as a purely nonmarket world. There is truly a race against time for creating such a world and for this reason, all movements that are potentially capable of contributing to the creation of a noncapitalist world are promising and worthy of support. Even a partial but thoughtful diagnosis of specific problems in particular regions relatively early on may suggest solutions which can be implemented before it is too late. This paper is written with the hope of making a modest contribution to the evolving counterhegemonic movements in our world by suggesting some pathways towards an egalitarian, deeply democratic and ecologically sustainable Global South.²²

Methodologically, the paper also implicitly presents the case for using Social Accounting Matrix (SAM)based models for understanding problems of equitable development strategies. More explicitly, linear as well as nonlinear models are presented in the appendix. The nonlinear modelling approach might prove to be especially relevant for studying the properties of multiple equilibria and complex dynamics. Furthermore, from another dynamic mathematical point of view, the propositions developed in this essay can be formalized in a multisectoral model with integrated finance. Based on some formal work of Jumarie and others in mathematics of entropy, a dynamic relativistic information theory based systems approach to development can be developed. Although this current ongoing research is very preliminary, the combination of nonlinear multiple equilibria systems with entropy minimization in developing economic systems can be shown to exhibit a wide range of dynamics from stagnation to rapid growth and transformation. It is particularly applicable to BRICS economies like PRC and India. Here too, a bridge to empirics via successive Social Accounting Matrices (SAMs) can be developed for empirical applications.

²² During my presentation at the New School, many interesting comments and questions arose. With respect to PRC, Prof. Clara Mattei raised the issue of perception of PRC as a leader in global ecological sustainability policies and Prof Ying Chen raised the question of how sincere the PRC leadership was in its support of genuine socialism. Prof. Chen pointed to recent repression of the leftist Marxist activists in PRC. I am most grateful for these comments and observations. Clearly, the issues are complex and require continuing observation and analysis.

Appendix 1: Growth impacts of the industrial and non-industrial sectors – a simple SAM-based Model

Fixed price modelling in a SAM-based framework

In this section of the appendix, the social accounting matrix is presented as a data-gathering framework as well as an analytical tool for studying the effects of the energy sectors on growth. Appendix 2 presents the methodology for estimating the impact of growth generated by both the industrial and non-industrial sectors on poverty alleviation. The origins of social accounting can be traced as far back as Gregory King's efforts in 1681, but more recent work stems from the attempts by Richard Stone, Graham Pyatt, Erik Thorbecke, and others.²³

In the methodological framework of this approach, the SAM is used for mapping production and distribution at the economy-wide level. In this section, first a general SAM is described. Then it is shown how the method for studying the effect of growth within this framework follows logically from its structure. The model used is a simple version of a class of SAM-based general equilibrium models.²⁴ It summarizes succinctly the interdependence between productive activities, factor shares, household income distribution, balance of payments, capital accounts, and so on, for the economy as a whole at a point in time. Given the technical conditions of production, the value added is distributed to the factors in a determinate fashion. The value added accrued by the factors is further received by households according to their ownership of assets and the prevailing wage structure. In the matrix form the SAM consists of rows and columns representing receipts and expenditures, respectively. As an accounting constraint receipts must equal expenditures.

As is elaborated further in Khan and Thorbecke (1988), the SAM framework can be used to depict a set of linear relationships in a fixed coefficient model. For deciding the question of determination, the accounts need to be divided into exogenous and endogenous ones. For instance, in the China SAM, there are three endogenous accounts.

These are factors, households and production activities, leaving the government, capital and the rest of the world accounts as exogenous.²⁵

Now if we divide the entries in the transactions matrix T_{mn} by the corresponding total income (that is, y_n), we can define a corresponding matrix of average expenditure propensities. Let us call this matrix A . Suppressing the subscripts for ease of exposition, we now have:

²³ For a description of SAM as a data-gathering device, see Pyatt and Thorbecke (1976). Khan (1997) also has a chapter on this alone.

²⁴ In Walrasian general equilibrium models the flexible price vector determines the equilibrium. In a Keynesian (dis)equilibrium model in the short-run the quantities vary while the price vector remains fixed.

²⁵ See Khan and Thorbecke (1988: ch. II) for more theoretical details and empirical examples. The presentations here follow the cited work closely.

$$y = (1 - A)^{-1} x = Mx \quad (1)$$

M has been called the matrix of accounting multipliers by Thorbecke, for these multipliers, when computed, can account for the results (for example, income, consumption, and so on) obtained in the SAM without explaining the process that led to them. Let us now partition the matrix A in the following way (Khan and Thorbecke 1988).

$$A = \begin{bmatrix} 0 & 0 & A_{13} \\ A_{21} & A_{22} & 0 \\ 0 & A_{32} & A_{33} \end{bmatrix} \quad (2)$$

Given the accounts factors, household and the production activities, now we see that the income levels of these accounts (call them y_1, y_2, y_3 , respectively) are determined as functions of the exogenous demand of all other accounts. In this respect, what we have is a reduced-form model which can be consistent with a number of structural forms. This is quite satisfactory as far as tracing the effects of a certain injection in the economy is concerned or for prediction purposes when the structural coefficients are more or less unchanged.

One limitation of the accounting multiplier matrix M as derived in equation (2) is that it implies unitary expenditure elasticities (the prevailing average expenditure propensities in A are assumed to apply to any incremental injection). A more realistic alternative is to specify a matrix of marginal expenditure propensities (C_n below) corresponding to the observed income and expenditure elasticities of the different agents, under the assumption that prices remain fixed. The C_n matrix can be partitioned in the same way as the A matrix above. The most important difference between the two partitioned matrices is that $C_{32} \neq A_{32}$. Expressing the changes in income (dy) resulting from changes in injections (dx), one obtains

$$d y_n = C_n d y_n + d x \quad (3)$$

$$= (I - C_n)^{-1} d x = M_c d x \quad (4)$$

M_c has been called a fixed price multiplier matrix and its advantage is that it allows any nonnegative income and expenditure elasticities to be reflected in M_c . In particular, in exploring the macroeconomic effects of exogenous changes in the output of different product-cum-technologies on other macroeconomic variables, it would be very unrealistic to assume that consumers react to any given proportional change in their incomes by increasing expenditures on the different commodities by exactly that same proportion (that is, assuming that the income elasticities of demand of the various socioeconomic household groups for the various commodities were all unity). Since the expenditure (income) elasticity is equal to the ratio of the marginal expenditure propensity (MEP_i) to the average expenditure propensity (AEP_i) for any given good i , it

follows that the marginal expenditure propensity can be readily obtained once the expenditure elasticity and the average expenditure propensities are known, that is,

$$y_i = MEP_i / AEP_i \quad (5)$$

$$MEP_i = y_i AEP_i \quad (6)$$

and

$$\sum_i MEP_i = 1 \quad (7)$$

Thus, given the matrix A_{32} of average expenditure propensities, and the corresponding expenditure elasticities of demand, y_i the corresponding marginal expenditure propensities matrix C_{32} could easily be derived.²⁶

²⁶ See Khan and Thorbecke (1988) for some examples. See also Pyatt and Round (1979: 861).

Appendix 2: Innovating and Other (including Energy) sectors, growth, distribution and poverty

Multiplier decomposition, growth and poverty alleviation sensitivity

Since poverty in the present context is measured by identifying a poverty line in monetary terms, incomes of the various household groups are the crucial variables. In particular, sectoral growth generated by the energy sectors must be linked to incomes of the various households in order to determine the exact extent of the alleviation of poverty through growth. The exact effect of income growth on poverty, of course, depends on the sensitivity of the adopted poverty measure to income. In this paper the Foster-Greer-Thorbecke (FGT 1984) P_α class of additively decomposable poverty measure is selected for this purpose. For $\alpha = 0, 1, n$ this measure becomes the headcount ratio, the poverty gap and a distributionally sensitive measure that gives specific weights to each poor person's shortfall, respectively.

If we apply Kakwani's (1993) decomposition to the P_α measure for specific sectors and households i and j respectively, the change in $P_{\alpha ij}$ can be written as follows:

$$dP_{\alpha ij} = \frac{\partial P_{\alpha ij}}{\partial \bar{y}_i} + \sum_{k=1}^n \frac{\partial P_{\alpha ij}}{\partial \theta_{ijk}} d\theta_{ijk} \quad (8)$$

Here $P_{\alpha ij}$ is the FGT P_α measure connecting sector j to household group i , y_i is the mean per-capita income of household group i , and θ_{ijk} is the income distribution parameter. Under the unrealistic but simplifying assumption of distributional neutrality:

$$\frac{dP_{\alpha ij}}{P_{\alpha ij}} = \eta_{\alpha i} \left(\frac{d\bar{y}_i}{\bar{y}_i} \right) \quad (9)$$

where $\eta_{\alpha i}$ is the elasticity of P_{ij} with respect to the mean per capita income of each household group i resulting from an increase in the output of sector j . $d\bar{y}_i$ on the right hand side is the change in mean per capita income of household group i . This can be written as (by considering the fixed price multiplier matrix)

$$dy_c = m_{ij} dx_j \quad (10)$$

where dx_j is the change in the output of sector j on a per capita basis for group j . We can now rewrite the average change in poverty measure as

$$\frac{dP_{\alpha ij}}{P_{\alpha ij}} = \eta_{\alpha i} m_{ij} \left(\frac{dx_j}{\bar{y}_i} \right) \quad (11)$$

By aggregating across the household groups we can arrive at the overall poverty alleviation effect

$$\frac{dP_{\alpha j}}{P_{\alpha j}} = \sum_{i=1}^m \left(\frac{dP_{\alpha ij}}{P_{\alpha ij}} \right) \left(\frac{\eta_i}{\eta} \right) = \sum_{i=1}^m \left(\frac{dP_{\alpha ij}}{P_{\alpha ij}} \right) \left(\frac{P_{\alpha ij}}{P_{\alpha j}} \right) \quad (12)$$

Since we are considering a P_α measure

$$\frac{d P_{\alpha j}}{P_{\alpha j}} = \sum_{i=1}^m \left(\frac{d P_{\alpha ij}}{P_{\alpha ij}} \right) \left(\frac{\sum_k ((z - y_k)/z)^\alpha}{\sum_l ((z - y_l)/z)^\alpha} \right) \quad (13)$$

where q_i is the number of poor in the i th group and the total number of poor $q = \sum_{i=1}^m q_i$

Let $s_{\alpha i}$ be the poverty share of household group i (naturally $\sum_{i=1}^m s_{\alpha i} = 1$)

$$s_{\alpha i} = \frac{\sum_{k=1}^{q_i} \left(\frac{z - y_k}{z} \right)^\alpha}{\sum_{l=1}^q \left(\frac{z - y_l}{z} \right)^\alpha} \quad (14)$$

We can further rewrite the expression for the average change in overall poverty alleviation.

$$\frac{d P_{\alpha j}}{P_{\alpha j}} = \sum_{i=1}^m \left(\frac{d P_{\alpha ij}}{P_{\alpha ij}} \right) s_{\alpha i} \quad (15)$$

Combining Equations 14 and 18, we now have

$$\frac{d P_{\alpha j}}{P_{\alpha j}} = \sum s_{\alpha i} \eta_{\alpha i} m_{ij} \left(\frac{d x_j}{\bar{y}_i} \right) \quad (16)$$

Thorbecke and Jung (1996) separate the income increase via the modified multiplier effect from the sensitivity of the poverty measure formally in Equation (19) by defining the following two entities:

- $m'_{\alpha ij} = s_{\alpha i} m_{ij}$ gives the modified multiplier effect in terms of income of a poor group.
- $q_{\alpha ij} = \eta_{\alpha i} (d x_j / \bar{y}_i)$ represents the sensitivity of the poverty index to the change in income. I adopt their terminology and call this the poverty sensitivity effect.

But each multiplier m_{ij} can be further decomposed:

$$m_{ij} = \eta_j d_{ij} \quad (17)$$

where η_j gives the (closed loop) interdependency effects and d_{ij} the distributional effects of a change in demand for the product of sector j on household group i .

Thus

$$\frac{d P_{\alpha j}}{P_{\alpha j}} = \sum_{i=1}^m m'_{\alpha ij} q_{\alpha ij} \quad (18)$$

$$= \sum_i^m (r_{\alpha ij}) (s_{\alpha ij} d_{ij}) (q_{\alpha ij}) \quad (19)$$

The d_{ij} on the right hand side can be further decomposed by multiplicatively decomposing the total distributive effects. Given the structure of C_n matrix:

$$D = D_3 D_2 D_1 \text{ where } D_3 = (I - C_{22})^{-1}; D_2 = C_{21} C_{13}, \text{ and } D_1 = (I - C_{33})^{-1}$$

The particular element for each household i and sector j can be selected from these three matrices.

Thus the contribution of an increase in output of a particular sector i to poverty alleviation can be decomposed multiplicatively into its two components: (i) the contribution due to the change in mean income of the poor across all groups and (ii) the sensitivity of the particular poverty measure to this change in average income of the poor.

Appendix 3: The SCENIS approach and an illustrative model

3.A. Technological Systems as Complex Structures

As the debate on the “East Asian miracle” underlines, the key strategic question for a country such as Korea or China or other BRICS that has made a technological transition from a traditional pre-capitalist to a modern capitalist system---and in case of China perhaps a mixture of capitalism and “socialism”--- increasing the total surplus(value) concerns the prospects for long-term economic growth, accumulation, distribution and building egalitarian. Ultimately, it is the sustainable long-term rate of growth that will determine the wealth that can be distributed among personal consumption, investment, government spending on infrastructure, defensive expenditures for ecological sustainability and public services, etc.

Therefore, it is the creation of a sustainable innovation system that will determine the viability of a technology-based growth process. This process of building an innovation system is very much an evolutionary and path-dependent process. (Nelson 1981, 1989, 1993, 1994; Nelson and Winter 1974, 1977, 1982) The central idea is that the provision of appropriate types of capital, labor and forms of organization for high value-added industries will lead to rapid productivity increases. However, to sustain such an increase, a domestic innovation system must be set up. There is a further requirement that this innovation system must fulfill. This is the requirement of a positive feedback loop or a virtuous cycle of innovations.

This problem, as we will see soon, is intimately connected with the existence of multiple equilibria and turbulent dynamics in complex economies. A positive feedback loop leading to a virtuous cycle of growth and technology development is one particular sequence of equilibria in this context. In general, such a sequence also involves increasing returns. In the remainder of this section a theoretical exploration of innovation with increasing returns and multiple equilibria will be undertaken.

In a market economy, ‘success’ is often cumulative or self-reinforcing. Typically outcomes are not predictable in advance. However, once equilibrium gets selected out of a number of long-run equilibria, there is a tendency to be locked in. Technically, economic processes exhibit non-convexities -- violating the generic assumption of competitive equilibrium economics. The presence of self-reinforcing mechanisms sharing common features found in fields as far apart as enzyme reactions and the economics of technical change underlines the importance of such mechanisms in governing the dynamics of self-reinforcing processes regardless of the field in which they occur. In a socialist economy, such an innovation process can be at least partially controlled. Furthermore, distributional and related political power concerns including moves towards deeper forms of democracy can also be better analyzed in a model of a complex and adaptive social and political economy.

3.B. A 'Simple' Non-linear Model of Complexity

In order to give the reader some idea of the problem of formalizing complex technological systems we summarize here the basic structure of a 'simple' non-linear model embodying distinct technological systems which can be applied to analyze the technological trajectories in countries like China. At any single point in time, the model can be presented as a Social Accounting Matrix (SAM) representation of the socio-economic system. The key distinction here is the explicitly non-linear nature of the economy-wide functional relationships. The key theorem shows the existence of multiple equilibria. Some further considerations of complexity and increasing returns show that multiple equilibria are indeed the natural outcomes in such models. Thus, there would seem to be some role for domestic policy in guiding the economy to a particular equilibrium among many.

The virtue of an economy-wide approach to technology systems is the embodiment of various inter-sectoral linkages. In a SAM, such linkages are mappings from one set of accounts to another. In terms of technology systems, the production activities can be broken down into a production (sub-) system and a set of innovative activities. In practice, this presents considerable difficulties of classification and empirical estimation.

One major component of the entire innovation system is, of course, the expenditures on R&D. In the SAM for Korea for example, this can appear either as an aggregate expenditure along the column labeled R&D, or as a set of disaggregated expenditures.³ In the latter case these may be specified according to productive activities (e.g., construction, electrical equipment, etc.) or by institutions (e.g., private R&D expenditures, government R&D expenditures, etc.). It should be emphasized that the dynamic effects of R&D on the economy can be captured only in a series of such SAMs over time. This approach is still at the conceptual stage, but appears to be quite appealing. One can contrast the possible policy experiments that can be undertaken within such a framework with the apparently *ad hoc* science and technology policies in many developing countries. In particular, the impact over time of a SCENIS can be traced by building and maintaining such SAMs.

Choice of new technology in a developing country is affected by research and development in at least three different ways. Such a country can attempt to develop new technology through R&D, as mentioned previously. This ultimately requires a positive feedback loop innovation system in order to be self-sustaining. Another alternative is to adapt existing technology. This too requires a production system geared towards innovation in a limited way. A third alternative is to import technology or to acquire it through attracting foreign direct investment. In practice, all these different forms may be combined. The abstract model embodies all these different possibilities. However, the first option requires, among other things, a presence of multiple equilibria with turbulent gravitating mechanisms.

We begin with a number of productive activities reflecting the existing technological structure. These activities are defined on the input-output subspace of the general and abstract mathematical space X . In addition to the values of inputs and outputs, points in this space could also represent household and other institutional income and expenditure accounts. We also incorporate the possibility of R&D as a separate productive activity. Formally, it is always possible to break R&D down into as many finite components as we want. The key relationship in this context is that between the endogenous accounts (usually, production activities and technologies, factors and households) and the exogenous ones. It is this relationship that is posited to be non-linear and this together with some assumptions on the relevant mathematical space can lead to the existence of multiple equilibria.

Although the existence theorems for these multisectoral models provide some structure for the turbulent equilibria as sequences of fixed points in the socio-economic structure with evolving technology systems, it is not specified a priori which equilibrium will be reached. The problem of equilibrium selection thus remains open. The idea behind a SCENIS can now be stated somewhat more formally. It is to reach a sequence of turbulent equilibria so that in the non-linear models of the entire economy the maximal fixed points that are attainable are in fact reached within a certain neighborhood through a combination of market forces and policy maneuvers over time. It is also to be understood that path-dependence of technology would rule out certain equilibria in the future. Thus initial choices of technologies can matter crucially at times. In a fully socialized economy the policy decisions are to be made democratically in a participatory economy. In an economy like China's it is largely an elite group's decision centered in CCP and large private enterprises.

3. C. The Model on a Lattice

Define X as a vector lattice over a subring M of the real field R . Let $x_+ = \{x \mid x \in X, x \geq 0\}$

A non-linear mapping N is defined such that $N : X_+ \rightarrow X_+, N_0 = 0$. Given a vector of exogenous variables d , the following non-linear mapping describes a simultaneous non-linear equations model of an economy, E :

$$x = Nx + d \quad (1)$$

for a given $d \in X_+$.

This non-linear system represents a socio-economic system of the type described previously. In order to specify the model further, the following assumptions are necessary.

1. X is order complete
2. N is an isotone mapping
3. $\exists \hat{x} \in X_+$ such that $\hat{x} \geq N\hat{x} + d$

In terms of the economics of the model, the non-linear mapping from the space of inputs to the space of the outputs allows for non-constant returns to scale and technical progress over time. The 3 assumptions are minimally necessary for the existence of

equilibrium. Assumption 3, in particular ensures that there is some level of output vector which can be produced given the technical production conditions and demand structure.

Existence of Multiple Equilibria:

Theorem: Under the assumptions 1 - 3, there exists $x^* \in X_+$ so that x^* is a solution of

$$x = Nx + d$$

Proof: Consider the interval $[0, x] = \{\hat{x} \mid \hat{x} \in X_+, 0 \leq \hat{x} \leq x\}$ where \hat{x} is defined as in assumption 3. Take a mapping F .

$$F : x \in X_+ \rightarrow Nx + d$$

F is isotone and maps $[0, x]$ into itself.

Define a set $D \equiv \{x \mid x \in [0, x], x \geq Fx\}$.

By assumption 3, D is non-empty.

We now show $x^* \equiv \inf D$ is a solution to $x = Nx + d$. $x^* \equiv \inf D$; therefore $x^* \leq x, \forall x \in D$. F is isotone; therefore $Fx^* \leq Fx \leq x$ for each $x \in D$ implying.

$$Fx^* \leq x^*$$

From (2) we have $F(Fx^*) \leq Fx^*$. Thus $Fx^* \in D$; hence $x^* \equiv \inf D \leq Fx^*$ so, $Fx^* \leq x^* \leq Fx^*$. Therefore $x^* = Fx^*$.

This is an application of Tarski's and Birkhoff's theorem. The key feature to note here is that the equilibrium is not necessarily unique. It should also be noted that under additional assumptions on space X and the mapping N the computation of a fixed point can be done by standard methods (e.g. Ortega and Rheinboldt).

3.D. Multiple Turbulent Equilibria on Banach Space:

In this section the results for multiple equilibria are extended to functionals on Banach Space. We can define the model again for monotone iterations, this time on a non-empty subset of an ordered Banach space X . The mapping $f : X \rightarrow X$ is called compact if it is continuous and if $f(x)$ is relatively compact. The map f is called completely continuous if f is continuous and maps bounded subsets of X into compact sets. Let X be a non-empty subset of some ordered set Y . A fixed point x of a map $N : X \rightarrow X$ is called minimal (maximal) if every fixed point y of N in X satisfies

$$x \leq y (y \leq x)$$

Theorem: Let (E, P) be an ordered Banach space and let D be a subset of E .

Suppose that $f : D \rightarrow E$ is an increasing map which is compact on every order interval in D . If there exist $y, \hat{y} \in D$ with $y \leq \hat{y}$ such that $y \leq f(y)$ and $f(\hat{y}) \leq \hat{y}$, then f has a minimal fixed point x . Moreover, $x \leq y$ and $x = \lim F^k(y)$. That is, the minimal fixed point can be computed iteratively by means of the iteration scheme

$$x_0 = y$$

$$x_{k+1} = f(x_k) \quad k = 0,1,2,\dots$$

Moreover, the sequence (x_k) is increasing.

Proof: Since f is increasing, the hypotheses imply that f maps the order interval $[\bar{y}, y]$ into itself. Consequently, the sequence (x_k) is well-defined and, since it is contained in $f[\bar{y}, y]$, it is relatively compact. Hence it has at least one limit point. By induction, it is easily seen that the sequence (x_k) is increasing. This implies that it has exactly one limit point \bar{x} and that the whole sequence converges to \bar{x} . Since f is continuous, \bar{x} is a fixed point of f . If x is an arbitrary fixed point in D such that $x \geq \bar{y}$, then, by replacing y by x in the above argument, it follows that $\bar{x} \leq x$. Hence \bar{x} is the minimal fixed point of f in $(\bar{y} + P) \cap D$. It should be observed that we do not claim that there exists a minimal fixed point of f in D .

We can also show that if $F : x \in X_+ \rightarrow Nx + d$ is an intersecting compact map in a non-empty order interval $[x, \hat{x}]$ and $x \leq Fx$ and $F\hat{x} \leq \hat{x}$ then F has a minimal fixed point x^* and a maximal fixed point x^{**} . Moreover, $x^* = \lim F^k(x)$ and $x^{**} = \lim F^k(\hat{x})$. The first of the above sequences is increasing and the second is decreasing.⁴

3E. Complex Turbulent Dynamics and Out-of-Equilibrium Behavior:

Complex Adaptive Systems(CAS) are dynamic systems that can evolve with a changing environment. In CAS evolutionary trajectories there is no separation between a system and its environment in the sense that a system does not necessarily passively adapt to a changing environment. On the contrary, we have a system closely linked with all other related systems making up an ecosystem. In this larger ecosystem, change is necessarily that of co-evolution with all other related systems, rather than as adaptation to a separate and distinct environment.

As is well known, nonlinear dynamic systems can display a wide range of dynamic behaviors. As Keynes perspicuously pointed out in the General Theory during the great depression, the capitalist economies with complex financial systems are unstable but within limits. However, as we know, dissipative systems with a big enough perturbation can move to a new basin of attraction with much disorganization during transition. Also, even with bifurcations, we do not know for certain which path it will follow. Furthermore, catastrophic singularities are also possible.

My argument can now be summarized in terms of , dissipative systems dynamics in a world of multiple equilibria none of which may be reached. Instead, a neoliberal global economy may simply go through cycles of instabilities. A large part of my argument, therefore, has been that the recent global crisis is an example of a large accumulated perturbation that has created instabilities giving us a foretaste of what may become a pattern in the 21st century unless a new global capabilities enhancing system of production and distribution along with new flexible hybrid Global Financial Architecture with sufficient liquidity and enforcement power is constructed soon. The BRICS bank and financial facilities are moves that can possibly dampen

further instabilities in the global financial system and help promote growth with equity particularly in the poorer countries in the global system. With the creation of enough BRICS-like multi-regional financial architectures after the failures and crises in the 21st century, the world will have a fighting chance to pursue appropriate capabilities-enhancing development strategies along with a deepening of civilized social democratic structures in the core countries.

Technically, the “micro-macro” linkages can also be addressed through agents-based modelling and evolutionary game theory. These are ongoing research projects.

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