Proceedings of ICEMGD 2026 Symposium: Data-Driven Business Management, Corporate Governance, and Organizational Performance
DOI: 10.54254/2754-1169/2026.LD35575

The Boundary Limitations of Neoclassical Growth Theory: A Study of Structural Inflation Based on Russia's Shock Therapy and Economic Complexity

Siyan Liu

Guangdong Country Garden School, Guangzhou, China
liusiyan@gcgsedu.com

Abstract. This paper examines the failure of Russia's 1990s "shock therapy" reforms, which were grounded in neoclassical growth theory but produced catastrophic outcomes: a 40% GDP collapse, hyperinflation exceeding 1,000%, and persistent resource dependency. We argue that these failures stemmed not from implementation errors but from applying a framework beyond its boundaries. The Solow model assumes well-established market institutions and treats growth as driven by factor accumulation; yet Russia entered transition with weak property rights, no competitive traditions, and a lack of an independent legal system, which enabled oligarchic capture of private assets. To address this explanatory gap, we draw on Economic Complexity Theory, which emphasizes tacit knowledge networks and industrial ecosystem density as determinants of prosperity. Russia's manufacturing capabilities collapsed during structural transformation: supply chains disintegrated, engineering cultures eroded, and skilled labor emigrated or shifted to non-productive sectors. This capability destruction created structural inflation, driven by import dependence and supply shortages—that contractionary monetary policy could not resolve. The paper concludes that neoclassical growth theory should be complemented with frameworks accounting for institutional development and productive capability accumulation. The policy implication is that monetary policy cannot substitute industrial policy or institutional investment, and market liberalization alone is insufficient when the productive foundations for growth remain underdeveloped.

Keywords: Neoclassical Growth Theory, Solow Model, Economic Complexity Theory, Russia's Shock Therapy, Structural Inflation

1. Introduction

"Russia wants to be free. Russia wants to be democratic. Russia wants to live by the rule of law. Russia wants to live in peace. Russia wants to prosper. Russia wants to be free and prosperous."

President Yeltsin declared these words in his inaugural address on July 10, 1991. This declaration reflected the Russian leadership's eagerness to embrace the free market and gave rise to one of the most ambitious economic experiments in modern history—"shock therapy." Grounded in neoclassical growth theory, the policies of price liberalization, mass privatization, and

DOI: 10.54254/2754-1169/2026.LD35575

macroeconomic stabilization were implemented with unprecedented speed. Yet the outcome fell short of expectations: GDP fell by nearly 40% between 1991 and 1998, hyperinflation peaked at over 1,000% annually, and the economy became trapped in a resource-dependent state that persists to this day [1, 2].

This paper asks two fundamental questions: Why did the best-intentioned economic reforms, grounded in the authoritative paradigm of neoclassical economics, produce such devastating results? And more importantly, what theoretical framework can better explain Russia's predicament and guide policy away from failures?

The analysis suggests that conventional growth frameworks may provide only a partial explanation for structural transformation. This paper is organized around three interconnected arguments. First, the Solow framework offers limited guidance on how productive capabilities and institutions evolve over time. Second, Economic Complexity Theory provides an alternative perspective by emphasizing tacit knowledge, capability accumulation, and the coordination of productive networks. Third, this interpretation also helps explain the limits of monetary policy in addressing structural inflation.

This paper does not argue that neoclassical growth theory should be rejected. Rather, it suggests that understanding development requires complementing factor-based approaches with frameworks that account for structural change and economic complexity. Russia's experience illustrates that market liberalization alone may be insufficient to generate sustained prosperity when the institutional and productive foundations of growth remain underdeveloped.

2. Limitations of neoclassical growth theory: theoretical critique and institutional inadaptability

2.1. Critique of the Solow model and the TFP black box problem

N. Gregory Mankiw, one of the representatives of neoclassical macroeconomics, defends the Solow model with the following words: "I have always found the high R^2 reassuring when I teach the Solow growth model. Surely, a low R^2 in this regression would have shaken my faith that this model has much to teach us about international differences in income" [3]. Such an argument may appear to be very reliable, as the high coefficient of determination seems to indicate that the Solow model is able to explain the trend of economic growth almost perfectly. However, this reassurance warrants closer examination.

Since the introduction of the Solow model, it has faced persistent critical attention. Among these criticisms, Felipe and McCombie [4] systematically indicate that the high R^2 cannot be regarded as independent evidence of the model's economic validity but rather reflects the underlying accounting identity from which the production function is derived. This does not diminish the Solow framework's value as a device for thinking about growth, but it does suggest that policy recommendations derived from such regressions, such as emphasizing capital accumulation should be complemented by attention to factors that the accounting identity fails to capture, including institutional development and productive capabilities.

The Cobb-Douglas production function is based on one of the simplest accounting identity $Y \equiv wL + rK$. Y is the representative of value added (GDP), w and L indicate real wage rate and labour input respectively, r is the return on capital and K means the capital stock. The identity indicates that the total output of a country (calculated using the income approach to GDP) equals wages received by labour plus interest received by capital owners, and it can be converted into the Cobb-Douglas production function after four steps.

DOI: 10.54254/2754-1169/2026.LD35575

Let's start by dividing both sides of the formula by Y :

$$\frac{Y}{Y}=\frac{wL}{Y}+\frac{rK}{Y} \tag{1}$$

$$1=\frac{wL}{Y}+\frac{rK}{Y} \tag{2}$$

In this way the shares could be defined, which refers to identifying the percentage of output paid to labour and to capital. According to the formula below, α represents the proportion of income that goes to capital owners as profit, whereas $(1-\alpha)$ is the proportion of income that goes to labour as wages:

$$\alpha=\frac{rK}{Y} \tag{3}$$

$$1-\alpha=\frac{wL}{Y} \tag{4}$$

$$1=1+(1-\alpha) \tag{5}$$

Then simply using Exponent Rules and Negative Exponent Rule will allow $Y\equiv wL+rK$ to be rearranged into Cobb-Douglas production function. $(\frac{Y}{K})^{\alpha}\bullet(\frac{Y}{L})^{1-\alpha}$ represent TFP which refers to the technological progress — efficiency improvements independent of factor inputs in neoclassical view:

$$Y\equiv(\frac{Y}{K})^{\alpha}\bullet(\frac{Y}{L})^{1-\alpha}\bullet K^{\alpha}\bullet L^{1-\alpha} \tag{6}$$

Let $$A=(\frac{Y}{K})^{\alpha}\bullet(\frac{Y}{L})^{1-\alpha}$$

Then $$Y=A\bullet K^{\alpha}\bullet L^{1-\alpha}$$

The tautology could be easily discovered by comparing the normal regression with the Solow "regression". In ordinary regression, the model represents a genuine hypothesis: $Y=f(X)+\varepsilon$, where ε appears as a random error — it may be large or small. As a result, R^2 may be high or low. In contrast, the Solow "regression" is an identity transformation instead of a hypothesis; A could adjusts automatically to make the identity hold as it is defined by K, L, α . As a result, R^2 is necessarily close to 1:

$$A=\frac{Y}{K^{\alpha}\bullet L^{1-\alpha}} \tag{7}$$

So as Felipe and McCombie put it, the empirical effort to calculate TFP is "akin to the quest for the Holy Grail"—appearing profoundly meaningful yet built upon an illusory foundation. This feature does not undermine the Solow model as a teaching tool or analytical framework. However, it does suggest that a high R^2 should not be read as independent evidence that capital accumulation and labor input alone drive growth—since the residual term A is endogenously defined by the accounting identity, which means the model's fit is preordained by its mathematical structure instead of empirical data.

DOI: 10.54254/2754-1169/2026.LD35575

2.2. Institutional and practical deficiencies of neoclassical policy application

As the foundational cornerstone of neoclassical economics, the Solow growth model has exerted profound influence over economic policy formulation across diverse institutional and geographical contexts.

The original assumption of Solow model assumes full employment, flexible prices, and market clearing in the long term, with no consideration of unemployment, inflation, or business cycles. In the 1950s-60s, the Neoclassical Synthesis considered the Solow model as the long-run framework for the economy's natural destination, determined by factor accumulation and exogenous technological progress, and incorporated Keynesian short-run analysis—featuring sticky prices, possible unemployment, and demand-driven output fluctuations. This allowed policymakers to rectify such temporary short-run deviations. To be more specific, monetary easing could be deployed amid economic downturns: policymakers may cut interest rates to stimulate investment, lift aggregate demand, and restore aggregate output in turn. The ultimate objective of this policy is to guide the economy back toward its long-run equilibrium path—the Solow steady state.

The Solow growth model treats institutions as exogenous background conditions that exist naturally and require no explanation or attention. The model assumes that robust property rights protection is fully established and effectively enforced, that antitrust laws and competition regulatory agencies ensure fair market competition, that consumer protection mechanisms prevent information asymmetries and fraud, that courts operate independently and impartially to enforce contracts, and information disclosure systems guarantee price transparency. Under this assumption, the system will adjust automatically in order to support the operation of the market. Policy makers only need to focus on the quantity of factor inputs.

Under ideal conditions, price liberalization will lead to a readjustment of prices, which provides profit signals to entrepreneurs and encourages them to enter the market. In this way, market competition arises naturally. When dominant firms adopt monopolistic conduct that creates severe negative externalities and social costs, market participants (consumers and excluded competitors) realise the problem and form an 'antitrust demand' naturally. Through mobilization of social pressure and the articulation of political demands, competition policies and consumer protection laws will be established.

The Solow model was mainly proposed based on the experience of mature market economies which have existed after evolving over hundreds of years such as the United States, assuming that institutions already exist. Consequently this logic seems to hold in most of the western market economies. However, Russian policymakers ignored that these policies are not the consequence of "price liberalization" but of its premises.

"Yeltsin considered a speedy transformation essential to prevent a resurgence of Soviet authority and definitively move Russia away from the Communist economic and political agenda." [5]. This implies that Russia's institutional framework was fundamentally unfit to safeguard private capital, entrench the rule of law, or sustain viable industrial operations. The planned economy inherited from the former Soviet Union lacked any conception of market competition; accordingly, antitrust legislation was entirely absent during the critical 1991-1995 period of revolution. Effective enforcement remained nonexistent until Competition Regulatory Authority（FAS）was introduced in 2004. The institutional monopoly of the former Soviet Union leaves Russia weak consumer protection mechanisms, which directly leads to severe information asymmetries. Additionally, Soviet courts operated merely as administrative tools, which meant that genuine judicial independence never took root. This institutional vacuum created serious price manipulation (or

DOI: 10.54254/2754-1169/2026.LD35575

manipulation of prices) through a sequence of failures: politically connected oligarchs took control of the major industries immediately after privatization; without antitrust legislation, meaningful competition was eliminated. This provided oligarchs with an opportunity to collude on pricing. As the market signal is distorted by political power, it no longer reflects "scarcity" but "monopoly power". Additionally, consumers could not conduct informed product comparisons, since mandatory information disclosure rules were entirely absent. Gazprom's monopoly on natural gas extraction and exports serves as a typical illustration: domestic gas prices were artificially held far below market equilibrium levels via state subsidies. However, ordinary consumers remained unable to access these cheaper substitutes because intermediary distribution channels were controlled by oligarchs. These intermediaries extracted massive monopoly rents, erasing all potential social welfare gains from subsidized energy prices.

3. Economic complexity perspective: explaining Russia's structural inflation and policy failure

3.1. Core logic of economic complexity theory

While the Solow model treats growth as a function of capital accumulation, labor input, and an unexplained TFP, Hausmann and Hidalgo [6] propose an alternative framework that that regards the complexity of goods a country produces as the main determinant of a country's economic performance.

Tacit knowledge is the cornerstone of economic complexity theory;, it was initially defined by Polanyi [7] as "We can know more than we can tell." In other words, it is the knowledge that people know and can perform, but cannot fully express or encode in language. On example is bicyclr riding: an individual may fully master cycling skills. Yet they cannot draft a comprehensive cycling handbook that others can follow and grasp instantly.

Hausmann & Hidalgo extended this individual term into social realm. In their framework, tacit knowledge is not merely personal skill but personal capability embedded in the social network of an economy. The personbyte—the amount of knowledge held by one person [6]—is limited; consequnetly, it is nearly impossible for an individual to master all the skills needed to produce a product. Consequently, a network needs to be built to enable the tacit knowledge of each individual to be put together. "The complexity of an economy is related to the multiplicity of useful knowledge, or knowhow, that its individuals possess and to the onion-like topology of the network connecting these individuals" [6]. In other words, accumulation of individual capabilities does not necessarily build up a highly complex economy. It's a country's ability to form a highly diverse and dense connection of capabilities that leads to a dense ECI. For example, Germany, a nation with exceptionally high economic complexity that relies on integrated manufacturing and service sectors, functions as a core supplier of sophisticated, rare goods within the global product space. Its specialized technical institutes, streamlined supply chains and century-old engineering culture jointly foster a thick industrial ecosystem that integrates dispersed personbyte endowments to manufacture sophisticated goods. "Ultimately, differences in prosperity are related to the amount of tacit knowledge that societies hold and to their ability to combine and share this knowledge." [6]. Nations boasting dense interconnected tacit know-how networks and the capacity to manufacture a diverse mix of sophisticated goods (e.g. precision watches and semiconductor chips) hold far greater potential for sustained economic prosperity.

DOI: 10.54254/2754-1169/2026.LD35575

3.2. Structural causes of Russia's monetary policy failure

The core goal of Russia's monetary policy is to curb inflation, and interest rates are frequently used as a primary policy tool. The monetary policy underwent an evolution from tightening (1990s) to stabilization (2000s) and then to extreme volatility (2010s-2020s). More recently, the nation experienced dramatic monetary tightening—including lending restrictions that restrain growth—but this failed to reduce inflation significantly after the stimulative policies of 2020 and 2021-2023. Glazyev warns that the Russian economy might be seriously harmed if monetary policy is used blindly and the structural nature of inflation is not identified. This persistent failure stems from a fundamental mistake: monetary policy aims at demand-side symptoms, while Russian inflation stems from a collapse in manufacturing capabilities due to erroneous structural transformation. The logic of globalization operates through comparative advantage-based international division of labor, resource-abundant countries like Russia naturally export natural resources and primary products. The prosperity of the resource sector attracts a large number of labour through higher wages and welfare. However, according to McMillan, minerals and natural resources do not generate enough employment compared to manufacturing industries, meaning that excess agricultural labour could not be absorbed effectively. Simultaneously, manufacturing industries are declining due to institutional resource curse [7] instead of Dutch disease— the mechanism traditionally used to explain the influence of natural resources on Russia's economic performance. According to the research conducted by Le Coq, Paltseva, and Volchkova [7], the dependency on access to energy resources fails to explain the difference in growth levels of manufacturing subindustries across Russian regions with various levels of natural resources. This goes against the mechanism of Dutch disease—manufacturing develops slower in resource-rich areas (Resources Department will absorb employees away from manufacturing industries). This situation runs counter to the traditional path dependence of development: labour reallocates from agriculture to manufacturing, driving aggregate productivity gains. In Russia, the resource sector does not need extra labour; manufacturing industries fail to develop because manufacturing roles appear less attractive compared to upstream operations, and surplus agricultural labour has no choice but to remain in low-efficiency agriculture or flood into the informal urban economy. This causes the shrinkage of the capability dimension and ultimately the collapse of manufacturing capabilities— technical skills are eroded, and tacit skills are lost as the industrial ecosystem collapses. With the disintegration of the supply chain, specialists emigrate to foreign countries or switch to non-productive departments. This has led to an economy becoming increasingly dependent on resource rents.

Additionally, the capability collapse resulted in Russia's long term reliance on imported industrial goods, which directly gives rise to the inflation. As domestic manufacturers fail to meet domestic customers' demand for consumer goods, machinery and intermediate inputs, the economy becomes import-dependent on essential goods and services. When sanctions disrupt these import channels, a shortage in supply naturally drives up the prices of goods. This could not be fixed by demand-side means. Secondly, escalating interest rates not only mitigates the demand-side pressure but also prevents the few manufacturing firms that still exist from investing due to high costs. This further stifles domestic innovation and the increase in economic complexity. Figure 1 illustrates the drastic volatility of Russia's inflation rate over nearly three decades, highlighting the persistent structural inflation pressures that demand theoretical explanations beyond conventional monetary theories.

DOI: 10.54254/2754-1169/2026.LD35575

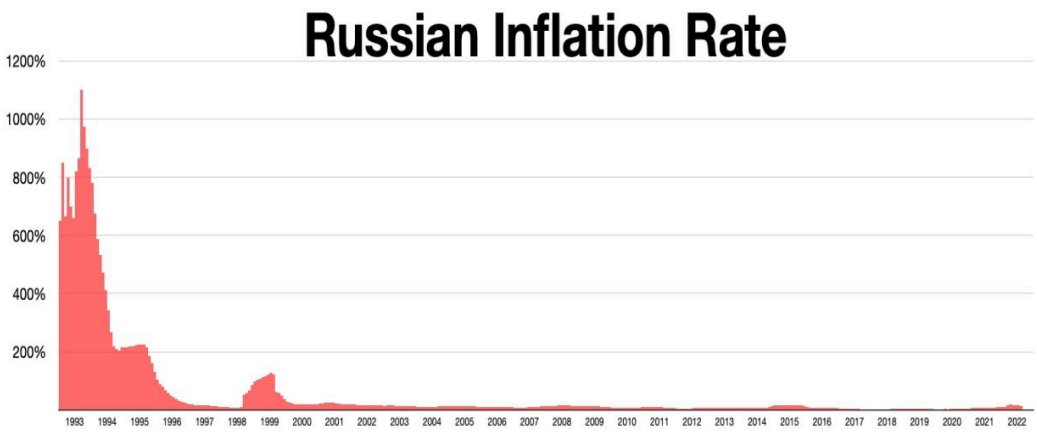

Figure 1. Russia's inflation rate fluctuations (1993-2022)

4. Conclusion

Russia's 1990s shock therapy that was grounded in Solow-neoclassical logic produced catastrophic outcomes: GDP collapsed 40%, hyperinflation exceeded 1,000%, and the economy became locked into resource dependency. This paper argues these failures developed not from implementation errors but from applying a framework beyond its appropriate boundaries. The Solow model was designed for mature market economies; it assumes markets and institutions work well on their own, but Russia's institutional vacuum enabled wealthy elites to take control of privatized assets and led to manufacturing collapse. Economic Complexity Theory offers a different perspective. Growth relies on tacit knowledge networks and the density of industrial ecosystems, not merely factor accumulation. Russia's tragedy was capability destruction: supplier networks were destroyed, engineering cultures vanished, and inflation became structural—unsolvable through hiking interest rates. This was an institutional resource curse, not Dutch disease—abundant oil revenues weakened elite incentives to develop alternative industries.

This paper does not reject neoclassical theory. It argues that understanding growth requires looking at both traditional factors like capital and labor, and at how economic structures and capabilities actually develop. The policy implication is clear: monetary policy cannot substitute for industrial policy or institutional investment. There is no universal reform plan—freeing up markets alone cannot fix an economy when its basic productive capabilities are still weak.

References

[1] Åslund, A. (2007). *Russia's capitalist revolution: Why market reform succeeded and democracy failed*. Peterson Institute for International Economics. https://piie.com/book-store/russias-capitalist-revolution-why-market-reform-succeeded-and-democracy-failed

[2] Stiglitz, J. E. (2002). *Globalization and its discontents*. W. W. Norton & Company. https://wwnorton.com/books/9780393324396

[3] Mankiw, N. G. (1997). Comment on "It's baaack: Japan's slump and the return of the liquidity trap." In B. S. Bernanke & J. J. Rotemberg (Eds.), *NBER Macroeconomics Annual 1997 (Vol. 12)*, pp. 93-110. MIT Press. https://www.jstor.org/stable/3585236

[4] Felipe, J., & McCombie, J. S. L. (2004). To measure or not to measure TFP growth? A reply to Mahadevan. *Oxford Development Studies, 32*(2), 321–327.

[5] Felipe, J., & McCombie, J. S. L. (2019). The illusion of the aggregate production function: The debate revisited (Working Paper No. 19-01). Asian Development Bank.

[6] Felipe, J., & McCombie, J. S. L. (2020). The illusions of calculating total factor productivity and testing aggregate production functions: Second thoughts on Pesaran's (2003) "aggregation of production functions" (Working Paper

DOI: 10.54254/2754-1169/2026.LD35575

No. 20-01). Asian Development Bank. https: //jesusfelipe.net/publications/

[7] Huygen, C. (2012). One step forward, two steps back: Boris Yeltsin and the failure of shock therapy. *Constellations, 3*(1). https: //doi.org/10.29173/cons16287