

Bofinger, Peter

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A New Schumpeterian Growth Theory (NSGT): the way out of Europe's middle-technology trap

Peter Bofinger
University of Würzburg, Germany

As the Draghi report shows, Europe needs to undergo a fundamental transformation in order to escape its 'mid-technology trap'. Mainstream economic theory offers little guidance on how to achieve this. A critical review of neoclassical growth theory shows that in these models, growth and innovation are gradual, risk-free processes driven by individual agents, providing no rationale for the active involvement of entrepreneurs, bankers, or the government. Consequently, traditional supply-side policies advocate a strategy in which the government is perceived as the problem rather than the solution. This paper presents a New Schumpeterian Growth Theory (NSGT) based on Josef Schumpeter's key insights. Key elements of the NSGT include the crucial importance of the financial sector as a financier of growth, the element of risk and uncertainty in the innovation process, the disruptive nature of innovation and growth, and the impact of growth on inflation. While Schumpeter ascribed a key role to 'the banker' in selecting promising innovation projects, the experience of many Asian countries shows that the state can also fulfil this function successfully. For Europe, this implies that the way out of the mid-technology trap is not to reduce the role of the state, but rather to increase it through a comprehensive industrial policy strategy.

Keywords: Innovation, Growth theory, Industrial policy, Schumpeter, Finance and growth

JEL codes: O11, O16, O25, O42

1 INTRODUCTION

Europe is facing its greatest economic challenges since the Second World War. From the East, it is challenged by China with its ambitious industrial policy focused on new electric vehicles, solar panels, and batteries. From the West, President Trump is threatening Europe and China with import taxes, which will further intensify Chinese efforts to export to Europe. To make matters worse, Europe is caught in a 'middle-technology trap': many of its companies are stuck in traditional business models, especially in the automotive, steel, and chemical sectors.

Mainstream economic theory offers little help in overcoming these challenges. As I will show, neoclassical growth theory, the proponents of which have been awarded three Nobel Prizes, explains everything, except growth itself. In these models, growth is a gradual and riskless process driven by atomistic agents, which provides no rationale for an active role of entrepreneurs, bankers or the government. As a result, traditional supply-side policies recommend a therapy in which the government is not the solution but the problem.

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In this paper, I present a New Schumpeterian Growth Theory (NSGT) based on key insights of Josef Schumpeter. I call this theory 'New Schumpeterian' because there already exists a so-called Schumpeterian growth theory, which, as I will show, has very little in common with Schumpeter's ideas. Key elements of the NSGT are the crucial importance of the financial sector as a financier of growth, the element of risk and uncertainty in the innovation process, the disruptive nature of innovation and growth, and the impact of growth on inflation. Of course, the importance of credit creation for the financing investment and growth is also emphasized in the Post-Keynesian literature, especially on 'endogenous money' (e.g., Minsky 1992; Kregel 2007). However, the explicit link between the financial system and innovation as a driver of growth does not play a key role in this literature.¹

While Schumpeter ascribed a key role to 'the banker' in selecting promising innovation projects, the experience of many Asian countries shows that the state can also play this role with great success. The implication for Europe is that the way out of the mid-technology trap is not to reduce the role of the state, but to increase it. Together with the business sector and academic research institutes, it must identify the areas in which Europe can successfully compete with China and the United States. On the basis of a 'Made in Europe 2035' strategy, it must finance technologies and help create markets for them.

2 EUROPE IN THE MIDDLE-INCOME TRAP

2.1 A worrying diagnosis

The Draghi report (European Commission 2024) presents a gloomy picture of the state of the European economy. Europe is severely lagging in new technologies: only four of the world's top 50 tech companies are European. China has a strong dominance in clean technology manufacturing, above all in batteries, electric cars, and solar modules. Especially in the automotive sector, it attacks a systemic sector of Europe's industry.² In the semiconductor value chain, South-Asian companies (39%) and US companies (38%) are the leading suppliers, with an overall market share of Europe of only 10%. The weakness in manufacturing goes hand in hand with the virtual absence of major digital platforms in Europe (Figures 1 and 2).

A report by the European Policy Analysis Group (2024: 4)³ comes to a similar diagnosis. It speaks of '**middle technology trap**', which has persisted for two decades:

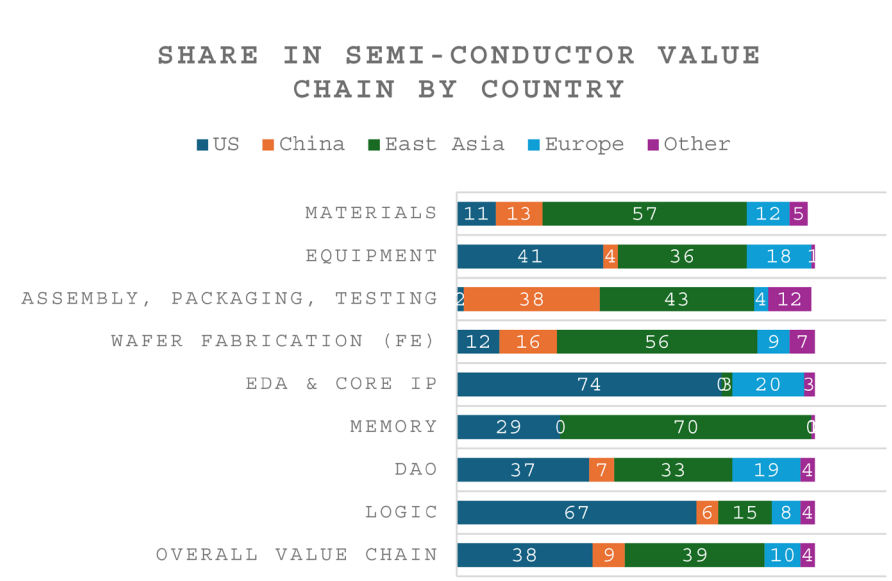
The largest EU companies in terms of R&D expenditures are almost invariably car producers, whereas in the US car producers, which were important 20 years ago, have been supplanted by software companies.

It also diagnoses a particularly wide transatlantic gap in software development, where US companies account for 75% of the global total, compared with 6% for the EU (less than China). As a consequence, the quasi-monopoly position of the US high-tech sector would also apply to the next generation of upcoming software and hardware.

1. While the focus of Minsky's approach is on the destabilizing forces of the financial system, he also acknowledges its positive effects: 'Banking and finance can be highly disruptive forces in our economy, but the flexibility of finance and its responsiveness to business, which are needed for a dynamic capitalism, cannot exist without the banking process' (Minsky 1986: 278).

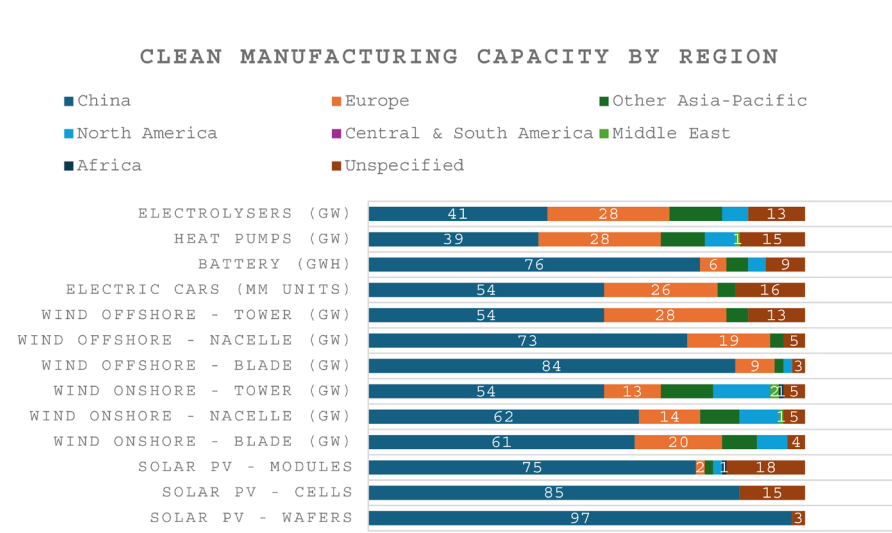
2. Therefore, some observes speak of a 'second China shock' (Tordoir and Setser 2025).

3. The members of the group are C. Fuest, D. Gros, P.-L. Mengel, G. Presidente, and J. Tirole.



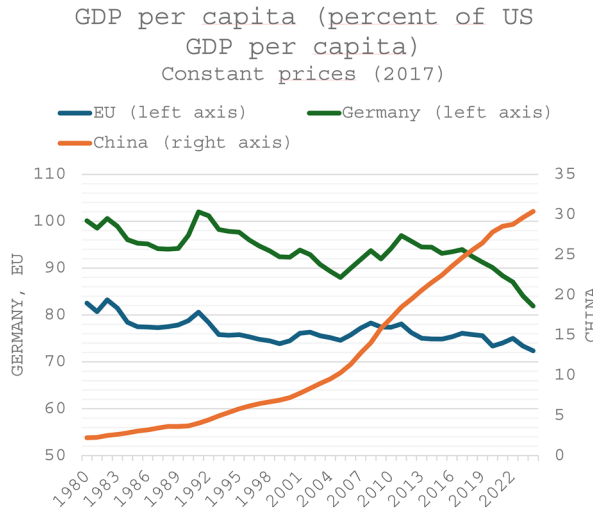
Source: The Draghi report (2024), A competitiveness strategy for Europe (Part A), p. 46.

Figure 1 China's dominance in renewables



Source: The Draghi report (2024), A competitiveness strategy for Europe (Part A), p. 57.

Figure 2 US and East Asian dominance in semiconductors



Source: Own visualization based on IMF World Economic Outlook data.

Figure 3 Europe is lagging behind

In macroeconomic terms, the weakness of the European economy, especially the German economy, is reflected in the fact that its GDP growth is lagging behind that of the United States. At the same time, China has so far been able to catch up with the US economy. This development is shown illustrated in Figure 3.

2.2 Policy options

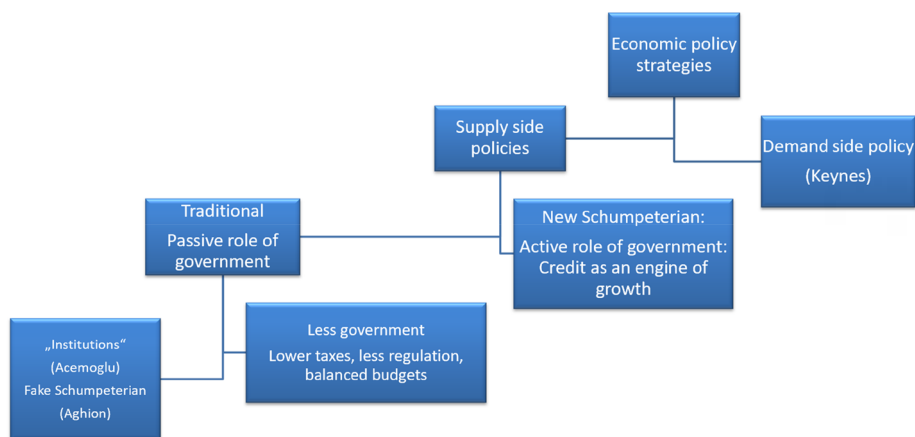
While the need to act is obvious, it is far less clear of how to overcome these challenges and how to design a strategy that leads Europe out of the middle-income trap. In a simplified way, one can classify the policy options in the following manner.

At a basic level, one can differentiate between **demand-side** and **supply-side policies**. With historically low unemployment rates in Europe, there is so far no obvious case for Keynesian policies stimulating aggregate demand, e.g., with lower taxes or higher government expenditures (Barigozzi et al. 2024).⁴ Especially, in the case of tax cuts, the risk is high that the additional demand fosters foreign suppliers without creating strong incentives for domestic suppliers to transform their companies. Overall, the rationale for Keynesian policies is to overcome an **underutilization of the existing capital stock** due to a temporary shock without a need to transform it fundamentally. Innovation and transformation are outside the standard Keynesian focus (Figure 4).

This leads to the realm of **supply-side policies**, which are typically associated with **market-liberal approaches**, as implemented by Ronald Reagan and Margaret Thatcher.

In this paper, I want to show that such approaches are inadequate for explaining and understanding the transformation and innovation challenge with which Europe is

4. One of the few economists currently suggesting demand-side policies is Marcel Fratzscher (2025).



Source: Own categorization of economic policy strategies.

Figure 4 Policy strategies

confronted. Therefore, I present an alternative concept of supply-side policy, which is based on Joseph Schumpeter's growth theory and adjusted to meet the conditions of the 21st century.

3 TRADITIONAL SUPPLY-SIDE POLICIES: THEORIES AND POLICIES

For an understanding of traditional supply-side policies, it is useful to give a short survey of the neoclassical growth theories. These theories can claim a high reputation as three of their main researchers have been awarded the Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel: Robert Solow in 1987, Paul Romer in 2018, and Daron Acemoglu in 2024.

3.1 A short survey of neoclassical growth models

As the basic expositions of the neoclassical growth model can be found in many textbooks, I will focus on the main assumptions and mechanisms of these models.

3.1.1 The Solow model

A core assumption of almost all neoclassical theories is that it is possible to describe and analyze economic growth and innovation with a model based on an all-purpose asset (APA). This asset can be used interchangeably in the following functions:

- It forms the **capital stock** of the economy, i.e., the **input** for the production process (K).
- It is the **output** of the production process (Y).
- It can be used for **consumption**, i.e., output of the APA that is not saved (C).
- It can be used as a '**financial fund**' or '**savings**', i.e., the output of the APA that is not consumed (S).
- It can be used as **investment**, i.e., the output of the APA that is saved (I).

In many textbooks, the unrealistic design of the neoclassical model is not made very explicit. Robert Barro and Xavier Sala-i-Martin (2004: 25) present it as follows in their textbook on growth theory:

One way to think about the one-sector technology is to an analogy with farm animals that can be eaten or used as inputs to produce more farm animals. The literature on economic growth has used more inventive examples – which such terms as smooths, putty or ectoplasm – to reflect the easy transmutation of capital goods into consumables, and vice versa.

The most far-reaching implication of this model design is the **exclusion of the financial system** as an autonomous driver of growth. In the world of the APA, 'funds' for investment are generated by households deciding to consume less in order to save. Hence, the saving decision is identical to the investment decision. Therefore, the model has no room for genuine financial decisions, i.e., decisions that are independent of decisions on real assets. Schumpeter (1954: 264) emphasizes this distinction by labeling this model design as '**real analysis**':

Real analysis proceeds from the principle that all the essential phenomena of economic life are capable of being described in terms of goods and services, of decisions about them, and of relations between them.

The logic of this model design becomes obvious in the so-called **loanable funds model**, which pretends to describe the '**capital market**'. It explains the interest rate with saving (=supply of funds) and investment (=demand for funds). As the saving decision is identical to the consumption decision, the model de facto tries to explain the capital market with the investment and the consumption decisions (Figure 5).

For the analysis of innovation, the neoclassical modeling has the further disadvantage, that in a world with only one asset, there is **no room for genuine innovation** in the sense of new output or input goods. As a consequence, investing, i.e., adding more and more of the all-purpose good, is confronted with **diminishing returns of scale**. It is not surprising that the basic model teaches that growth processes sooner or later come to an end.

Since this cannot be reconciled with reality, Solow introduced an exogenous growth trend as a *deus ex machina*. That is why these models are called exogenous growth models. Thus, Solow obtained growth simply by assuming exogenous technological change. 'Productivity improvements occur without anyone taking any actions' (Jones 2019: 868).

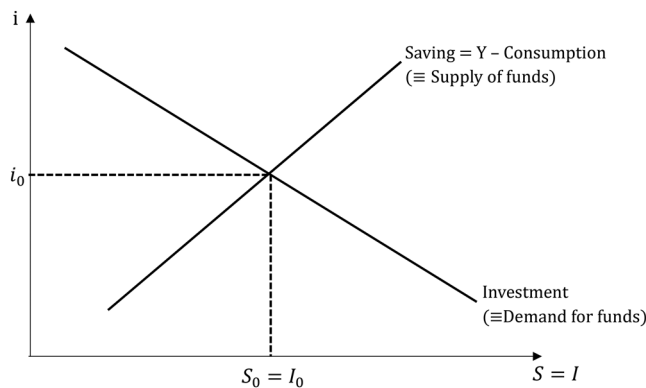


Figure 5 Loanable funds model

Thus, the logic of the model could be also applied to a Robinson Crusoe environment. Or in the words of Schumpeter (1934: 63): The entrepreneur ‘has no function of a special kind there, he simply does not exist’.

The empirical evidence shows that this **unexplained growth driver** is responsible for most of the growth dynamics. In the words of Solow (1988: 313):

Anyway, the main result of that 1957 exercise was startling. Gross output per hour of work in the U.S. economy doubled between 1909 and 1949; and some seven-eighths of that increase could be attributed to ‘technical change in the broadest sense’ and only the remaining eighth could be attributed to conventional increase in capital intensity.⁵

This has not changed until today. In his widely used textbook, David Romer (2019: 99) frankly admits:

The models we have seen so far do not provide satisfying answers to our central questions about economic growth. The models’ principal result is a negative one: if capital’s earnings reflect its contribution to output, then capital accumulation does not account for a large part of either long-run growth or cross-country income differences. And the only determinant of income in the models other than capital is a mystery variable, the ‘effectiveness of labor’ (A), whose exact meaning is not specified and whose behavior is taken as exogenous.

3.1.2 The Romer model

With his endogenous growth model, Paul Romer (1990) tried to find a way out of the limitations characterizing the Solow model. In its core, it is still based on the **logic of the all-purpose asset**.

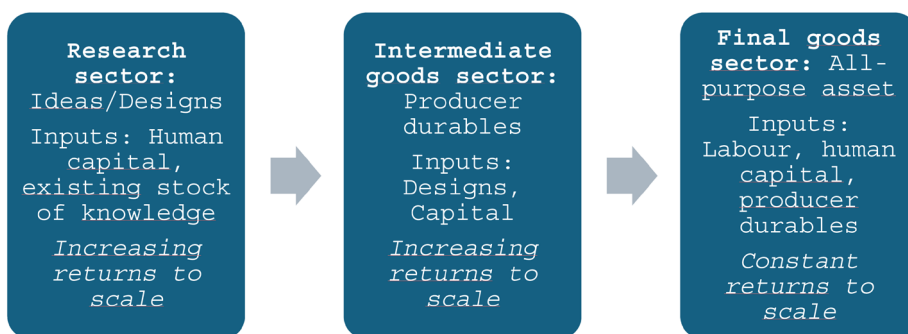
- The **capital stock**, which is one of the **main inputs** of the production process, consists of units of the all-purpose good. Romer describes total capital (K) as the cumulative forgone output.
- The **final output** of the production process also consists of units of the all-purpose good.

To overcome the problem of diminishing returns of capital, Paul Romer’s innovation is the introduction of **roundabout-process** with an additional input good and an additional intermediate good.

- The **additional input good**, which he calls ‘ideas’ or ‘designs’, is produced with human capital and the existing stock of knowledge. Its production does not require labor. This good is characterized by a **non-rivalry, but necessarily a non-excludability**, in its use.
- The **additional intermediate good**, which Romer calls ‘producer durables’ or ‘capital goods’, is produced with the all-purpose asset and the available number of ‘designs’. For this building block of the model, Romer uses the not very intuitive assumption that no labor is needed to produce the intermediate product. As ‘designs’ are non-rival goods, the production of the intermediate good with designs and the APA is characterized by increasing economies of scale.⁶

5. Growth Theory and After, Robert M. Solow *The American Economic Review*, June 1988, 78(3) 307–317.

6. Jones (2019) explains this as follows: For non-rival goods constant returns to scale apply. If we wish to double the production of cars from a factory, one can build an equivalent factory across



Source: Own creation.

Figure 6 Romer's roundabout process

The final output, which consists of the all-purpose asset, is produced with producer durables, human capital, and producer durables (Figure 6).

The roundabout process helps to overcome the diminishing returns that are due to investing more and more of the APA. Instead of directly using the APA as input for the production process, it gets refined with 'ideas' in the intermediate goods sector in a process with increasing returns to scale.

While the intermediate sector could be regarded as a source of innovation, Romer (1990: S81) treats the 'capital goods' even if they are produced by different firms as perfect substitutes:

(...) total capital K is implicitly defined as being proportional to the sum of all the different types of capital. This definition implies that all capital goods are perfect substitutes.

Thus, the 'capital goods' are nothing but a transformation of the APA at a constant conversion rate η . In the words of Romer (1990: S81):

(...) the formal specification here describes the sector that produces capital goods as a black box that takes final output in on one side and gives capital goods out of the other side.

In sum, the theory of endogenous growth does not provide more insights into the process of innovation and growth than Solow model. The *deus 'ex machina'* are unspecified 'ideas' or 'designs', which boost the productivity of the APA by transforming it into an intermediate asset that is used to produce the APA. In addition, the production of new ideas is not different from the process of baking bread:

(...) any person can devote human capital to either the final-output sector or the research sector.
(...). One must imagine that there are some skilled persons who specialize in human capital accumulation and supply no labor. (Romer 1990: S85)

In other words, innovation does not require any long-term decisions and accordingly there are no risks or uncertainties in the innovation process.

the street and populate it with equivalent workers, materials, and so on. With 'ideas' that are freely available, increasing returns to scale become possible. E.g. in the case of the second car factory, the existing number of ideas (technology) can be used. Thus, if the increase in the non-rival goods is paralleled by an increase in number of ideas (new technologies), the output of the carmaker more than doubles.

3.1.3 *The so-called Schumpeterian growth model*

In the Romer model, new inventions take a tiny share of the market from each existing producer while adding up more and more ‘designs’. In the so-called Schumpeterian growth model, innovations make existing designs obsolete.

(...) better products render previous ones obsolete. (Aghion and Howitt 1992: 323)

Nevertheless, the model also uses the assumption of an all-purpose asset. While it abstracts from capital as an input factor, there is only one type of output good. It is produced with an intermediate good that consists of labor only.

A key feature of this approach is the idea that competition – or free entry – should be growth-enhancing. According to Aghion et al. (2013: 6), empirical studies point to a positive correlation between growth and product market competition. They argue that non-Schumpeterian growth models cannot account for it:

AK models assume perfect competition and therefore have nothing to say on the relationship between competition and growth; and in Romer’s product variety model, higher competition amounts to higher degree of substitutability between the horizontally differentiated inputs, which in turn implies lower rents for innovators and therefore lower R&D incentives and thus lower growth.

A main implication of this model is that ‘(...) faster innovation-led growth is generally associated with higher turnover rates, i.e. higher rates of creation and destruction, of firms and jobs; moreover, competition appears to be positively correlated with growth (...)’ (Aghion et al. 2013: 1)

At a more general level, this approach emphasizes also the importance of ‘property right protection, and openness, education, and democracy’ (Aghion et al. 2013: 1).

A surprising feature of this approach is the explicit **reference to Schumpeter**. Although he coined the phrase ‘creative destruction’, he was anything but an advocate of pure competition. In ‘Capitalism, Socialism and Democracy’, Schumpeter (1943: 358) wrote:

Theirs is the ideology of a capitalist economy that would fill its social functions admirably by virtue of the magic wand of pure competition, were it not for the monster of monopoly or oligopoly that casts a shadow on an otherwise bright scene. No argument avails about the performance of largest-scale business, about the inevitability of its emergence, about the social costs involved in destroying existing structures, about the futility of the hallowed ideal of pure competition -or in fact ever elicits any response other than most obviously sincere indignation.

3.1.4 *Acemoglu, Johnson, and Robinson*

A related approach can be found in the works of Daron Acemoglu, Simon Johnson, and James Robinson. The Royal Swedish Academy of Sciences awarded the Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel 2024 to these economists for having demonstrated the importance of societal institutions for a country’s prosperity:

This year’s laureates in the economic sciences – Daron Acemoglu, Simon Johnson and James Robinson – have demonstrated the importance of societal institutions for a country’s prosperity. Societies with a poor rule of law and institutions that exploit the population do not generate growth or change for the better. The laureates’ research helps us understand why. (The Nobel Prize, 2024)

It is surprising that the authors limit the scope of their research to countries that were former European colonies without taking into account the experience of Asian countries, which are the most dynamic economies since the Second World War.

3.2 The shortcomings of the neoclassical growth models

3.2.1 Theoretical limitations

In sum, the model design based on an all-purpose asset has far-reaching limitations for the neoclassical growth theories.

The basic models cannot discuss and analyze the role of the **financial system**, especially of banks, in the growth and innovation process. While there is a vast literature based on King and Levine (1993) that tries to find such a role and explicitly refers to Schumpeter, it is based on the logic of the all-purpose asset and is therefore not able to explain the role of the financial system as a genuine engine of growth (Bofinger et al. 2024)

The neoclassical models assume that there are no **demand-side restrictions or implications** for the growth and innovation process. Solow (1988: 309) openly admits the neglect of the demand-side in his theory:

I think I paid too little attention to the problems of effective demand.

At a more general level, the neoclassical growth models lack a **link between the micro-economic sphere**, which they discuss intensively, and the **macroeconomic sphere**, where they assume that saving is automatically transferred into investment. In the words of Solow:

My view was, and still is, that the most urgent current analytical need was for a way of fitting together short-run macroeconomics, when the main action consists of variations in aggregate demand, with the long run factors represented by the neoclassical growth model, when the main action is on the supply side. (Solow 2001)

With a focus on an unchanging output good, the models are not able to develop a genuine **theory of the innovation** process. Even in the Romer model, the innovators are atomistic agents producing unspecified 'ideas' or 'designs' in an incremental way. The 'capital goods' produced with 'ideas' are perfect substitutes and no more than an upgraded version of the all-purpose asset. The lack of true innovation in these models is also responsible for the complete absence of risk or uncertainty in the growth process.

3.2.2 Lack of empirical evidence

In spite of the theoretical elegance and the Nobel Prizes awarded to the authors of the key contributions, the neoclassical growth theories hardly provide any empirical evidence for the dynamics of the growth and innovation process. This applies above all to Paul Romer's model, which adds little to the understanding of the differences in the growth processes in the real world. In the words of David Romer's textbook:

One of our central goals over the past three chapters has been to understand the vast variation in average income per person around the world. So far, however, our progress has been very limited. (...) A key implication of models of endogenous growth is that since technology is nonrival, differences in technology are unlikely to be important to differences in income among countries. (Romer 2019: 149)

Jones (2019: 874) criticizes the specification of the 'idea production' function:

(...) there is ample evidence suggesting that Romer's original specification of the idea production function is, from an empirical standpoint, flawed. (...) the original Romer formulation states that the growth rate of productivity is proportional to the amount of resources devoted to research. The problem with this formulation is easy to see: productivity growth rates are relatively stable over time, while the resources devoted to innovation show large exponential trends. (...) In

the presence of the growing resources devoted to research that we observe empirically in the past 50 or 100 years, the Romer set-up suggests that we should see large increases in growth rates. Put differently, if one adds population growth to Romer (1990), then the model no longer generates a steady-state growth rate. Instead, growth rates explode over time.⁷

At a more general level, the neoclassical models have almost nothing to say about the impressive **growth performance in several Asian countries**. This applies to Paul Romer whose only statement that can be found on the internet on China is as follows:

China's growth reflects is rapid embrace of these two big meta-ideas, the market and the city. (Romer 2016)⁸

In a similar way, Acemoglu and Robinson (2012) wrote:

Our theory also suggests that growth under extractive political conditions, as in China, will not bring sustained growth and is likely run out of steam. (436)

Because of the party's control over economic institutions, the extent of creative destruction is heavily curtailed (...). Just as in the Soviet Union, the Chinese experience of growth under extractive political institutions is greatly facilitated because there is a lot of catching-up to do. (441)

Milanovic (2019: 73) criticizes this analysis as follows:

Acemoglu and Robinson thus have to dismiss these countries' success by arguing in *Why Nations Fail* that it cannot last forever, or to be more precise, that unless China democratizes, it must fail once it reaches the technological level at which countries with extractive institutions are allegedly unable to innovate (Acemoglu and Robinson 2012: 441–442). This 'China must ultimately fail' theory of history is very weak except in the trivial sense that nothing can last forever.

An explicit critique of the neoclassical approach based on the Chinese performance can be found in Wen (2016: 2):

China's astonishing 30-fold expansion of real GDP since 1978 was unexpected, not merely because of its pervasive backwardness after centuries of turmoil and economic regress, but because of its enduring 'extractive' and authoritarian political institutions — which, according to the institutional theories of economic development, would predict nothing but dismal failure for China's industrialization.

3.3 Policy implications

The neoclassical models provide a fruitful theoretical basis for traditional supply policies. In its core, such policies regard the government not as a solution for growth and innovation, but as a main hindrance. In the words of a group of distinguished German economists (Feld et al. 2024): 'State intervention is part of the problem, not the solution'.

As the short survey of the neoclassical growth theories shows, the models do not discuss **the role of the government** at all. This is above all because public investment is a foreign body in the neoclassical models. In a world with an all-purpose asset and a unique production function, the government cannot improve outcomes by acting as a debt-financed investor (Bofinger 2022). Therefore, as, e.g., Blanchard (2023) shows, the only rationale for government is reducing excessive private investment by transferring all-purpose assets to consumers.

7. Bloom et al. (2020) after having examined a host of evidence at different levels of aggregation also come to the conclusion that the Romer specification of the idea production function is misguided.

8. <https://paulromer.net/economic-growth/>.

The modeling of innovation as a black process with atomic investors generating gradual increases in 'ideas' provides no theoretical framework for discussing the **role of entrepreneurs** in the innovation process, be it private or public investors. It reflects the view of neoliberal economists that innovation is a result of an anonymous 'market' or, in Hayek's words, of an atomistic discovery process:

(...), the knowledge of which I am speaking consists to a great extent of the ability to detect certain conditions—an ability that individuals can use effectively only when the market tells them what kinds of goods and services are demanded, and how urgently. (Hayek 2002: 13)

Thus, in the neoclassical world, there is no room for innovation as the result of far-sighted and risk-taking entrepreneurs discovering completely new technologies and products which are completely unknown to consumers.

4 ELEMENTS OF A NEW SCHUMPETERIAN GROWTH THEORY

The deficiencies of the neoclassical growth theories show that we need an alternative theoretical approach for analyzing and explaining economic growth based on innovation. Such a theory could provide a framework for designing policies for transforming the European economy in a way that it can get out of the 'middle technology trap'.

Key elements of an alternative growth paradigm can be found in Joseph Schumpeter's works, especially in his 'Theory of Economic Development' (Schumpeter 1934). It is surprising to see that his approach is completely opposed to the basic ideas of the neoclassical theories. This applies above all to the so-called 'Schumpeterian Growth Theory' (Aghion et al. 2013). For this reason, I will call the theory that will be developed in this paper 'New Schumpeterian Growth Theory'.

4.1 Building blocks

This paradigm consists of the following **building blocks**:

- A '**monetary analysis**', as Schumpeter calls, instead of a 'real analysis'. This implies that the monetary sphere is independent from the real sphere and that money and credit are not a neutral veil but autonomous drivers of the growth and innovation process.
- An innovation process, which is not generated in an anonymous and gradual process with atomistic agents but from '**bankers**' and **entrepreneurs**.
- Instead of accumulating more and more of the same all-purpose good, Schumpeter's growth theory emphasizes the **different use of existing resources**.
- In contrast to Romer's vague concept of 'ideas' or designs, Schumpeter argues that it is the **implementation of innovations** that matters.
- While the demand-side of the growth process are neglected in the neoclassical theory, Schumpeter explicitly discusses **the inflationary effects of innovation**. This is related to his description of innovation and growth as process that creates a **temporary disequilibrium** before a new equilibrium at a higher level can be reached.

4.2 Monetary analysis vs real analysis: credit as an engine of growth

The most fundamental difference between the neoclassical growth theory and NSGT concerns the role of the financial system in the growth process. As already mentioned,

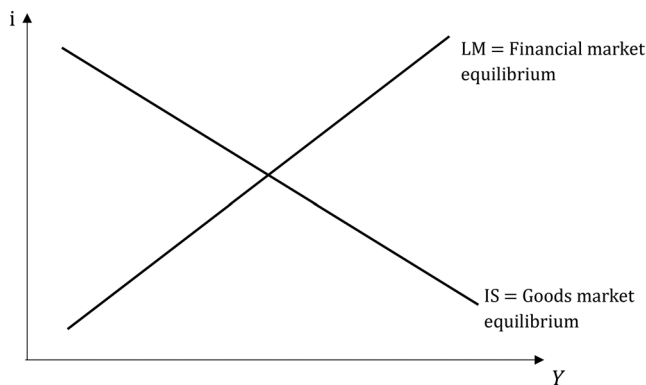


Figure 7 IS/LM model

the neoclassical paradigm does not possess an autonomous monetary sphere. Its model design with only an all-purpose asset leaves no room for autonomous financial decisions.

In his ‘Theory of Economic Development’, Schumpeter (1954: 262) criticizes this paradigm and contrasts it with a ‘monetary analysis’, which is characterized by the fact that banks can create financial funds ‘out of nothing’ so that they do not depend on ‘savings’ that are provided from households abstaining from consumption.

It is always a question, not of transforming purchasing power which already exists in someone’s possession, but of the creation of new purchasing power out of nothing (...) which is added to the existing circulation. (Schumpeter 1934: 62)

Schumpeter does not derive a comprehensive theoretical framework for his ‘monetary analysis’. But it could be easily approximated by the **standard IS/LM model**. This workhorse of traditional macroeconomics makes the explicit separation of the monetary and the real sphere with the IS-curve presenting equilibria in the real sphere and the LM-curve presenting equilibria in the monetary sphere (Figure 7).

A closer look at the LM-curve shows that it includes a banking system (central bank and commercial banks) that can create money, which allows for credit independent of saving.⁹ At the same time, the model shows that saving has no impact on the monetary sphere, but rather on the real sphere, i.e., the IS-curve.

The possibility to create purchasing power for innovation independently of saving fundamentally changes the dynamics of growth and innovation processes. It separates the provision of financial funds for innovation from the provision of real resources for innovation. This makes it possible to generate **a disequilibrium between the provision of financial funds and real funds**, which could not emerge in the neoclassical theory. This disequilibrium is a key feature of Schumpeter’s growth theory.

It is spontaneous and discontinuous change in the channels of the flow, disturbance of equilibrium, which forever alters and displaces the equilibrium state previously existing. (Schumpeter 1934: 54)

9. The underlying mechanism of the ‘money multiplier’ is flawed as it assumes a causality from central bank money causing the creation of deposits (commercial bank money), which does not exist in reality (Bofinger.) But it does not put into question the general principle that financial funds and their creation are disconnected from saving decisions.

The discontinuity emphasized by Schumpeter contrasts with the gradual growth processes described by neoclassical theory where the final output good, i.e., all-purpose asset, remains always the same. He explicitly criticizes the neoclassical approach:

Different methods of employment, and not saving and increases in the available quantity of labor, have changed the face of the economic world in the last fifty years. (Schumpeter 1934: 47)

With his 'monetary analysis', Schumpeter opens the perspective for **credit as engine of growth** which is completely absent in the neoclassical theory.

4.3 Bankers and entrepreneurs as agents of innovation

In the neoclassical theory, innovation is the outcome of gradual and anonymous market processes with atomistic agents. As Schumpeter (1934: 55) puts it, the entrepreneur 'simply does not exit'. This reflects the Hayekian philosophy of a discovery process driven by an anonymous market: This is completely different in Schumpeter's world where the **entrepreneur** is a key agent of innovation:

The carrying out of new combinations we call 'entreprise'; the individuals whose function it is to carry them out we call 'entrepreneurs'. (Schumpeter 1934: 62)

In Schumpeter's world, it is not the market that drives innovation but the entrepreneur who develops new products that so far were unknown to consumers:

Yet innovations in the economic system do not as a rule take place in such a way that first new wants arise spontaneously in consumers and then the productive apparatus swings round through their pressure. We do not deny the presence of this nexus. It is, however, the producer who as a rule initiates economic change, and consumers are educated by him if necessary; they are, as it were, taught to want new things, or things which differ in some respect or other from those which they have been in the habit of using. (Schumpeter 1934: 47)

With the entrepreneur as an agent of innovation, Schumpeter differentiates between the role of 'ideas' ('inventions') in the sense of Romer, and innovation:

Economic leadership in particular must hence be distinguished from 'invention.' As long as they are not carried into practice, inventions are economically irrelevant. And to carry any improvement into effect is a task entirely different from the inventing of it, and a task, moreover, requiring entirely different kinds of aptitudes. Although entrepreneurs of course may be inventors just as they may be capitalists, they are inventors not by nature of their function but by coincidence and vice versa. Besides, the innovations which it is the function of entrepreneurs to carry out need not necessarily be any inventions at all. It is, therefore, not advisable, and it may be downright misleading, to stress the element of invention as much as many writers do. (Schumpeter 1934: 72)

Thus, Schumpeter's approach differs from Romer's world. While Romer uses the diffuse concept of 'ideas', which automatically find their way to the market, Schumpeter emphasizes the role of implementing ideas by entrepreneurs.

The separation of the monetary sphere from the real sphere implies that the resources that the entrepreneur needs for innovation are not provided from consumers saving the APA but from banks.

The only man he (the entrepreneur) has to convince or to impress is the banker who is to finance him. (Schumpeter 1934: 72).

Thus, in Schumpeter's growth theory, the banker is the dominant agent of the innovation process:

The banker, therefore, is not so much primarily a middleman in the commodity purchasing power as a producer of this commodity. However, since all reserve funds and savings to-day usually flow to him, and the total demand for free purchasing power, whether existing or to be created, concentrates on him, he has either replaced private capitalists or become their agent; he has himself become the capitalist par excellence. He stands between those who wish to form new combinations and the possessors of productive means. He is essentially a phenomenon of development, though only when no central authority directs the social process. He makes possible the carrying out of new combinations, authorises people, in the name of society as it were, to form them. He is the ephor of the exchange economy. (Schumpeter 1934: 62)

It is important to note that in Schumpeter's view the entrepreneur is never 'the risk bearer':

The entrepreneur is never the risk bearer. In our example this is quite clear. The one who gives credit comes to grief if the undertaking fails. For although any property possessed by the entrepreneur may be liable, yet such possession of wealth is not essential, even though advantageous. But even if the entrepreneur finances himself out of former profits, or if he contributes the means of production belonging to his 'static' business, the risk falls on him as capitalist or as possessor of goods, not as entrepreneur. Risk-taking is in no case an element of the entrepreneurial function. (Schumpeter (1934: 121f.)

This differentiation differs from the view of Knight who regards 'risk-taking' as the essential function of the entrepreneur. Knight (1921: 231) differentiates between

- 'uncertainty which can by any method be reduced to an objective, quantitatively determinate probability, can be reduced to complete certainty by grouping cases', and
- a 'higher form of uncertainty not susceptible to measurement and hence to limitation. It is this true uncertainty which by preventing the theoretically perfect outworking of the tendencies of competition gives the characteristic form of "enterprise" to economic organization as a whole and accounts for the peculiar income of the entrepreneur'.

Knight's differentiation between uncertainty that can be measured or, in his words, 'risk' and true uncertainty for which he uses the term 'uncertainty' is very useful. But lack of a differentiation between the banker and the entrepreneur reflects the neglect of finance by banks or other financial institutions in Knight's theory.

In sum, in Schumpeter's world, innovation is not a gradual process financed by saving and executed by anonymous agents producing always the same final product. It is a 'revolutionary' change (Schumpeter 1934: 54) driven by far-sighted bankers and entrepreneurs. Thus, it is not an abstention of private households from consumption that is required for growth, but the willingness of the banker and the entrepreneur to start an endeavor with an unknown outcome.

This has far-reaching **implications for economic policy**: Innovation is not the quasi-automatic outcome of anonymous market processes as long as they are not disturbed by high-taxes, government regulations, and bureaucracies. Innovation must be actively shaped by people who have a clear vision of the future. In order to shape it, they must be willing to incur risks, and they need 'purchasing power' from banks or other financiers if their own financial funds are insufficient.

4.4 The macroeconomic dimensions of the New Schumpeterian approach

The neoclassical theory does not pay very much attention to the macroeconomic dimensions of economic growth. It simply assumes that saving is automatically transformed into

investment. Due to the assumption of the all-purpose asset, this transformation does not create a major problem. The interest rate mechanism secures that a reduced consumption demand is automatically compensated by an increased investment demand.

Above all, innovation and growth are not necessarily equilibrium processes. In the words of Solow:

(...) a theory of equilibrium growth badly needed – and still needs – a theory of deviations from the equilibrium growth path. (Solow 1988: 309)

It is the merit of Schumpeter that he developed a theory of growth that is based on deviations from a macroeconomic equilibrium. His starting point is a static equilibrium, which he describes as a '**circular flow**':

In the circular flow, from which we always start, the same products are produced every year in the same way. For every supply there waits somewhere in the economic system a corresponding demand, for every demand the corresponding supply. All goods are dealt in at determined prices with only insignificant oscillations, so that every unit of money may be considered as going the same way in every period. A given quantity of purchasing power is available at any moment to purchase the existing quantity of original productive services, in order then to pass into the hands of their owners and then again to be spent on consumption goods. (Schumpeter 1934: 79)

The ability of banks to generate additional purchasing power, which is provided to the entrepreneur is **a disturber of this equilibrium**:

If now credit means of payment, new purchasing power in our sense, are created and placed at the entrepreneur's disposal, then he takes his place beside the previous producers and his purchasing power its place beside the total previously existing. Obviously this does not increase the quantity of productive services existing in the economic system. Yet 'new demand' becomes possible in a very obvious sense. It causes a rise in the prices of productive services. From this ensues the 'withdrawal of goods' from their previous use, to which we have referred. The process amounts to compressing the existing purchasing power. In one sense no goods and certainly no new goods correspond to the newly created purchasing power. But room for it is squeezed out at the cost of previously existing purchasing power. (Schumpeter 1934: 80)

The disturbance of the 'circular flow' by creating additional purchasing necessarily has an inflationary effect. Schumpeter speaks of '**credit inflation**'. But he regards this as a temporary phenomenon only.

After completing his business — in our conception, therefore, after a period at the end of which his products are on the market and his productive goods used up — he has, if everything has gone according to expectations, enriched the social stream with goods whose total price is greater than the credit received and than the total price of the goods directly and indirectly used up by him. Hence the equivalence between the money and commodity streams is more than restored, the credit inflation more than eliminated, the effect upon prices more than compensated for. (Schumpeter 1934, 79)

This idea can be represented by **a reinterpretation of the quantity theory of money**. The key equation of this theory is:

$$\text{Money} \times \text{Velocity} = \text{Real GDP} \times \text{Price level}$$

It assumes that with a constant real GDP and a constant velocity of money, an increase in the money supply must lead to an increase in the price level. As the creation of money by banks is typically identical with the provision of credit, one can assume that the money

stock is identical with the amount of credit.¹⁰ If one also assumes, in line with Schumpeter, that the loan by an entrepreneur increases GDP by innovative investments, and that credit inflation can be ‘eliminated’, the quantity equation can be rewritten as follows:

$$\text{Credit} \times \overline{\text{Velocity}} = \text{Real GDP} \times \overline{\text{Price level}}$$

Thus, after the full adjustment process, i.e., when the effect upon prices is ‘more than compensated for’, the additional credit supply leads to higher real GDP, but not necessarily to a higher price level. In this way, the New Schumpeterian approach overcomes the neutrality of money, as discussed above, which is a key feature of neoclassical economics. Credit becomes an engine or even a precondition for growth and innovation:

(...) in carrying out new combinations, ‘financing’ as a special act is fundamentally necessary, in practice as in theory. (Schumpeter 1934: 59)

5 POLICY IMPLICATIONS OF A NEW SCHUMPETERIAN GROWTH POLICY: A TRANSFORMATIVE SUPPLY-SIDE POLICY

Schumpeter wrote his ‘Theory of Economic Development’ over a hundred years ago. Nevertheless, it has more to say about economic growth and innovation than the modern neoclassical growth theories. This concerns above all the process of innovation, which is a black box in neoclassical models. In these models, innovation is an impersonal, automatic, gradual, atomistic, and riskless process that happens by itself. In Schumpeter’s world, innovation requires far-sighted actors that are willing to bet huge amounts of money for the financing of completely new projects with an uncertain outcome. This different perspective has important policy implications.

The most important implication is for the **role of government** in the innovation process, which is consistently understated (Proaño 2022). In the neoclassical theory, this role is limited to providing ‘institutions’ (Acemoglu), free competition (Aghion) or financing basic research and general education. A Schumpeterian approach leads to a much more active role for the government.

5.1 The role of the government in the financing of risky investments

In a realistic growth theory, **risk and above all uncertainty** are the key challenges for fundamental innovations. As Mazzucato (2013: 59) puts it, such innovations do ‘not only take years to materialize into new products, but most of them fail’. It is obvious that today the private banking system cannot play the key role in the innovation process that Schumpeter assigned to it. Thus, risky projects must be financed either by private investors in the form of venture capital or by the government who uses the banking system as a source for funds. The financing by the government can be provided directly by different forms of subsidies or by credits from state-owned banks.

In the case of very risky projects, e.g., like the development of nuclear energy, it is obvious that only the government is able to bear the risks. In the words of Keynes (1926: 19):

10. Money and credit are strongly related and even identical in a closed economy.

Table 1 Biggest subsidies for Tesla

	Location	Year	Amount
Tesla Motors	Nevada	2014	\$1,287,000,000
SolarCity Corp.	New York	2014	\$750,000,000
Tesla Motors	Nevada	2015	\$725,800,000
Tesla Motors	Nevada	2023	\$330,250,366
Tesla Motors	Nevada	2015	\$245,856,460
Tesla Motors	Nevada	2015	\$103,137,512

Source: <https://subsidytracker.goodjobsfirst.org/parent/tesla-inc.>

The important thing for Government is not to do things which individuals are doing already, and to do them a little better or a little worse; but to do those things which at present are not done at all.

This supports the NSGT perspective according to which the government is not a disturber of the market but a necessary enabler of innovation and growth. Neoliberal economists question the ability of the government to identify new products and new technologies. But in the case of **deep-tech innovations**, i.e., innovations that fundamentally change our lives,¹¹ they do not provide the evidence that private investors have been more successful than the government.

It is the merit of Mariana Mazzucato (2013) to have shown many examples of innovative technologies that were the direct or indirect outcome of government activities. In the case of technologies, like renewable energies, which require a whole ecosystem, it is obvious that the government has better foresight than individual players.

An interesting example of the government as a financier of new technologies is **Tesla**. While Musk is propagating the virtues of the free market, he received substantial financial support from the government in the years 2014/2015 when he was trying to scale up his company (Table 1).

Above all, a theory that puts the financing of innovation by the financial system and the government as a key enabler in the center in the growth process is able to explain the success stories of the many **Asian economies** in the past 70 years, which until now has remained a blind spot in the neoclassical growth theories. A detailed analysis of the role of the Chinese government and financial system can be found in Bofinger et al. (2023).

5.2 Financing innovations with government debt

As the example of China illustrates, state support for innovative companies in the form of subsidies or equity injections is often financed by state debt. In particular, China's

11. The European Institute of Innovation and Technology (2023) describes such innovations as follows: 'Deep technology or Deep Tech is a classification of an institution, an organisation or a start-up company, with the expressed objective of providing advanced and emerging technology solutions to deep societal challenges. They present scientific or engineering challenges requiring lengthy research and development, and large capital investment before successful commercialization. Their primary risk is technical risk, while market risk is often significantly lower due to the clear potential value of solution to society. The underlying scientific or engineering problems being solved by deep tech companies generate valuable intellectual property and are hard to reproduce. Moreover, the solutions provided by deep technology and applications are critical for solving the complex global challenges that humanity faces, including climate change, sustainable energy or health'.

Table 2 Role of government under different conditions

	Unemployment/negative output gap	Full employment
Classical/real analysis	NA	Pure public finance
Monetary analysis	Functional finance (Keynesian fiscal policy) Modern Monetary Theory	Entrepreneurial state (Schumpeterian finance)

provinces have built up a high level of debt over the past two decades. The role of government debt as an instrument for mitigating the risks, especially of deep-tech innovations, cannot be found in traditional textbooks on fiscal policy (Blanchard 2023).

- In neoclassical theories, which only apply to full-employment situations, the only role for government debt is the reduction of excessive capital formation. Blanchard (2023) speaks of ‘**pure public finance**’.
- In Keynesian theories, debt-financed public investment is required for the stabilization of an economy that is in an unemployment disequilibrium. Blanchard (2023) speaks of ‘**functional finance**’.

The New Schumpeterian approach leads to a new rationale for government debt. It can be used for transforming an economy from a low equilibrium to a higher equilibrium by creating a temporary disequilibrium. Thus, government debt can play a constructive role even in full-employment situations, which allows to close the theoretical gap in the literature (Table 2).

The risk-taking aspect of the financing of private investments by government debt does not require that the government provide funds in the form of grants or loans. The most adequate form of financing would be equity.

In China, this approach (‘**government-guided funds**’) plays an important role in the financing of new companies. Data for 2020 show that Chinese officials had set up 1,741 guidance funds, with a registered target size of 11 trillion RMB (1.55 trillion USD). However, these funds had only raised a total of 4.76 trillion RMB (672 billion USD) from private and public sources (Centre for Security and Emerging Technology).¹² In March 2025, China announced that it will set up a government-backed fund that will mobilize 1 trillion yuan (\$138.01 billion) from social capital to support technology startups. The ‘national venture capital guidance fund’ – an investment vehicle set up as public–private partnership – would focus on ‘hard technology’ (semiconductors and renewable energy).¹³

5.3 The government as a market maker for new products

Schumpeter’s emphasis on completely new products leads to another important role of the government in mitigating the risks of the innovation process. If innovation creates products that are unknown to consumers, there is a need to ‘educate’ them. In other words, innovation requires that a demand for new products, i.e., new markets, must be created.

12. <https://cset.georgetown.edu/publication/understanding-chinese-government-guidance-funds/>.

13. <https://www.reuters.com/world/china/china-set-up-national-venture-capital-guidance-fund-state-planner-says-2025-03-06/>.

While Schumpeter argued that this is the task of the entrepreneur, there is also a role for the government.

The markets for renewable energies are a good example for the role of the government **nurturing new markets**. With feed-in-tariffs, governments guaranteed investors in solar-power and wind-power a long-term perspective. This provided the basis not only for the financing of such projects by banks but also for producers of solar panels and wind turbines to build up the required production capacities. In the same way, governments can support other new technologies, e.g., artificial intelligence, by acting as a consumer of first resort.

This role of the government is emphasized in a recent study by Münchner Kreis (2024: 39) who emphasizes the need for 'a fundamental deep tech update' of the German economy:

The public sector must be aware of the crucial role it plays in deep tech and, as an advocate, financier, trailblazer and pioneer, must promote deep tech from basic research to application with determination and foresight, and make it possible despite headwinds. The public sector is not only called upon to act as an 'enabling' legislator, but must also see itself as a pioneer in the application and support of deep tech and create targeted demand when the ecosystem is too sluggish.

Table 3 Key differences between the two approaches

	Traditional supply-side policy	New Schumpeterian supply-side policy
Theory	Neoclassical growth theory: Real sphere identical with financial sphere due to assumption of an all-purpose asset (APA)	Monetary analysis: Financial sphere independent of real sphere due to coexistence of real assets and financial assets
Financing of growth and innovation	Saving of households	Banks as producers of purchasing power
Dynamics of growth and innovation	Gradual increase in the available amount of the APA	Revolutionary (disruptive) process by the creation of new production processes
Agents of growth and innovation	Anonymous market process with atomic actors (Hayek)	Entrepreneurs (Knight) and Bankers (Hayek), 'Entrepreneurial State' (Mazzucato)
Risk/Uncertainty	Absent	Key feature of fundamental innovation (Mazzucato)
Role of the state	Passive: Institutions, democracy, property rights, low taxes, low regulation	Active: Identifying new technologies, risk-taking, and market making for the implementation of new technologies (Vertical industrial policy)
Competition	Positive effect on growth and innovation (the so-called Schumpeterian Theory) (Aghion)	Temporary monopolies (Schumpeter)

6 SUMMARY

The challenges that confront the European economy today show the deficiencies of the neoclassical growth theories. They describe gradual, atomistic, and riskless growth trajectories where the output of the production process is always an unchanging all-purpose asset. As a consequence, these theories have nothing to say about the transformation of economies and the innovation processes that this requires.

In this paper, I try to show that key elements of such a transformative growth theory can be found in the publications of Joseph A. Schumpeter. He emphasizes the disruptive or revolutionary feature of innovation. In contrast to Keynesian theories, which describe the mechanism that leads from a (unemployment) disequilibrium back to a previous equilibrium, Schumpeter's focus is on innovation processes that lead from an equilibrium to a temporary disequilibrium to arrive at a new equilibrium at a higher level.

With his emphasis on the decisive role of the financial system for innovation and the important role of bankers and entrepreneurs in the innovation process, he paves the way for a transformative supply-side approach fundamentally opposed to traditional supply-side policies. In the former, the government's role is limited to provide an adequate institutional framework without interfering with economic activities; in the latter, the government adopts an active role, especially by taking the risks of innovative technologies, which are characterized by uncertainty in the meaning of Knight. The key differences between the two approaches are summarized in Table 3.

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