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## South-South Integration and the SDGs: Enhancing Structural Transformation in Key Partner Countries of the Belt and Road Initiative

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# The role public national development banks play in the structural transformation of developing countries

### Abstract

This policy brief analyses the role public development banks (PDBs), and especially national ones, play in the structural transformation of developing countries. The policy brief studies the general conditions which facilitate public development banks to support effectively structural transformation in developing countries, draws lessons from the role public development banks have played in China and other developing countries that have experienced structural transformation, and the aspects in the experience of these successful economies that can offer valuable experiences for other developing countries, given each country's own characteristics and specific national challenges with regard to structural transformation.

**Key words:** public development banks; structural transformation; roles of development banks; Chinese banks

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## Contents

1. Introduction .....	3
2. Brief theoretical framework .....	3
3. Desirable roles of development banks.....	6
4. Conditions for development banks to support structural transformation .....	8
5. Some lessons from Chinese NDBs; the case of CDB.....	11
6. Brief conclusions and policy recommendations .....	13
References.....	15

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## 1. Introduction

The scale of several existing national development banks (NDBs) is already very large, and therefore they have a significant impact nationally and globally, including especially on countries' catch-up growth and structural transformation. If we add all public development banks (PDBs) (including multilateral, regional and national ones, of which the latter are by far the largest in terms of scale), they represent cumulative assets of more than US\$ 11.4 trillion, roughly the equivalent of 70 per cent of the assets of the entire US banking sector. Furthermore, in 2019, all development banks (DBs) made annual commitments of US\$ 2.3 trillion, which was equivalent to 10 per cent of the world gross fixed capital formation (Griffith-Jones et al, 2020a, drawing on AFD/INSE database). Particularly since the 2007–2009 North Atlantic financial crisis, and even more since the Covid-19 crisis, there has been a real renaissance of development banks, and a growing appreciation of their important roles, including in providing counter-cyclical finance in “bad” times, and in providing, at all times, long-term funding to help finance the major structural transformation and catch-up growth urgently needed to achieve more dynamic, inclusive and low-carbon economies.

China is clearly a dominant player in the field of development banking, with its three major “policy banks” (as DBs are called in China having assets worth US\$ 3.7 trillion, 32 per cent of the world’s total assets of all development banks). Furthermore, the Chinese Development Bank (CDB) is by far the largest development bank in the world, with assets of US\$ 2.6 billion, in 2020. It is also one of the largest NDBs in the world, when looking at its assets, as a proportion of GDP.

This Policy Brief focusses on the role national development banks (NDBs) play in the structural transformation of developing countries, in particular China. It starts by discussing in section II a brief theoretical framework, then in section III, it describes the roles that NDBs can and do play, with special emphasis on their role in structural transformation; section IV discusses the conditions, both relating to the NDB themselves and to the broader policy environment, which are desirable to be met, to ensure that NDBs can effectively and sufficiently contribute to the task of structural transformation. Sufficient scale of the NDB to help maximize its impact and a clear policy mandate, in the framework of a clear development and structural development strategy are highlighted as particularly important. Section V highlights particularly important lessons from Chinese development banks, which are also discussed in the previous sections. Section VI briefly concludes.

## 2. Brief theoretical framework

The discussion on development banks needs to be placed in the context of the broader debate on the desirable nature and structure of the financial sector.

In the three decades after World War II, the financial sector functioned quite well particularly in the developed world. National and multilateral development banks were created and were broadly seen to perform valuable developmental roles. Private domestic financial sectors were relatively small and fairly tightly regulated. However, there were policy concerns that “financially repressed” systems, as

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they were then wrongly called, were inefficient. From a theoretical perspective, the idea that “financial markets were efficient” encouraged financial liberalization (Gurley and Shaw 1955, McKinnon 1973) in an era of light or no regulation. This process was associated with frequent and costly crises. Diaz-Alejandro (1985) perceptively synthesized this early on as: “Good-bye financial repression, hello financial crisis”. Within the efficient financial market school, the existence of public financial institutions, such as development banks, was – almost by definition – seen as negative. As a consequence, development banks were criticized – fairly and mainly unfairly – and their role was reduced sharply in many developing countries.

An alternative theoretical approach emphasized credit rationing, which describes a situation in which, even when agents are willing to pay a higher interest rate to get the funds to finance their investments, private banks may refuse financing. The approach of credit rationing justifies the existence of development banks, which would supply the necessary credit to investment, unavailable in the private financing system. This approach is associated with the theory of market failures in financial markets (Stiglitz and Weiss, 1981; Stiglitz, 1990) in which credit rationing occurs due to imperfect information or information asymmetry, which prevents financial markets from functioning efficiently. Furthermore, adverse selection and moral hazard accentuate these market failures.

Importantly, Stiglitz (1994) argues that market failures in financial markets are likely to be endemic as those markets are particularly information intensive, thus making information imperfections and asymmetries as well as incomplete contracts more important and disruptive than in other economic sectors. Therefore, in important parts of financial markets, market failures tend to be greater than government failures, as Stiglitz (1994) insightfully argues. In such cases government interventions are more desirable than in other sectors if their benefits outweigh their costs. This provides a first robust case for a “visible hand of government,” both through effective public development banks and through robust regulation of private financial markets.

Stiglitz and Greenwald (2014) further argue clearly that knowledge and information markets also have huge market imperfections, and that knowledge and information are basically public goods. As a consequence, governments have a clear role in promoting a learning society, to help achieve innovation broadly defined, leading to increases in productivity. One of the institutional vehicles for helping achieve such a learning society are development banks. Besides providing long-term finance, they can provide specific incentives, through their lending, for innovation. Furthermore, because of their long-term perspective, they can help fund, accumulate and coordinate expertise in specific areas of innovation and in “learning how to learn” (Mazzucato, 2013).

Naturally, in this task they need to, and do, collaborate with other actors, both public and private. This role in accumulating and promoting knowledge and learning, which has not been sufficiently explored in the literature, cannot be well accomplished by most private financial institutions, as they focus mainly or exclusively on short-term profits, and tend not to be interested either in past experience or in future externalities. Development banks therefore need to help fill the gap.

From a complementary theoretical perspective several writers (e.g. Kregel, 1988; Wray, 2009) argue that there is a preference for liquidity amongst investors, as well as banks, which is responsible for the limitations of the supply of credit in the economy, especially in the long term. There may be a lack of

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credit for investment even when there are well-developed national and international financial systems. Therefore, as pointed out above, the importance of development banks goes beyond the question of "market failure", though it builds on it, to the need for "creating new markets", where these do not exist, and are essential for the structural transformation of economies. Thus, a strand of literature has argued (Xu, 2017, building on Lin, 2012) that development banks are well positioned to incubate markets for long-term finance that is crucial to economic structural transformation especially in developing economies where private financial markets are underdeveloped and follow a logic that pursues short-term profits.

A complementary perspective argues that, given the intrinsic uncertainty about future returns, especially for investing in new missions/sectors / projects/companies that require financing, private banks and capital markets often offer no or insufficient finance (especially long term) even if the financial system is fully developed, but much more so in developing economies. Therefore, the existence of development banks is made highly desirable by the existence of sectors and investment projects that require funding for the future structural transformation and development of the economy, but have high uncertainty as to their future, (especially short-term) success (Mazzucato, 2013; Mazzucato and Penna, 2018; Griffith-Jones et al, 2020b). Because of that, they may not be funded by the private financial system, which prefers sectors or investment projects whose expected returns are more uncertain. The former are often highly complex and capital-intensive sectors/projects/missions requiring sophisticated expertise in their evaluation that takes into account positive impacts across the economy (positive externalities, for example in terms of helping mitigate climate change via lower carbon emissions, as renewable energy does) and/or those in which social returns exceed private returns.

It is interesting that development banks, and notably the European Investment Bank (EIB), evaluate projects not only on a purely commercial basis, but also in an environmental way, incorporating a "shadow" price for carbon, which is significantly higher than the market price and growing over time. NDBs have the type of expertise (e.g. from engineers and scientists) that can evaluate such new projects and sectors, to take account of such externalities, and more broadly the long-term potential of such investment.

Furthermore, a key market imperfection in the operation of financial markets, basically across the board, is the tendency to "boom-bust", with a feast of finance followed by famine, both in domestic and in international finance. Building on the theoretical tradition of Keynes (1936) and Minsky (1977), Kindleberger (1978) developed a historical analysis, which considers financial crises as a response to previous excesses. Such excesses seem clearly far greater in financial and banking markets that are more liberalized and not properly regulated. The pro-cyclical nature of private finance implies the need for public development banks to provide both short-term, and especially long-term, counter-cyclical finance, as well as the need for counter-cyclical regulation of banking and financial markets. Brei and Schlarek (2018) provided important empirical evidence for the counter-cyclical role that national development banks play. More recent evidence on the valuable counter-cyclical response of national development banks in the response to the economic crisis caused by Covid-19 is provided (for example in Barrowclough et al, 2020, as well as ECLAC, 2021). Such counter-cyclical support is crucial also for structural transformation, as it can provide the long-term finance to continue funding investment in this transformation, even in times when economies are slowing down or declining.

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### 3. Desirable roles of development banks

The theoretical context, as well as empirical evidence of the large role that NDBs play in different countries, and particularly in China, helps define the roles that NDBs do and need to play. Given the limitations that private financial sectors have, development banks play an essential role from both counter-cyclical financing and structural transformation needs.

As argued in the conclusions of the book by Griffith-Jones and Ocampo (2018), NDBs should have five main roles: (i) providing counter-cyclical financing; (ii) promoting innovation and structural transformation; (iii) supporting infrastructure investment; (iv) enhancing financial inclusion; and (v) supporting the provision of public goods, particularly combatting climate change. To this has been added recently, a crucial immediate role, (vi) which is to help fund urgent health needs (e.g. development of vaccines), and ensure that post Covid-19 recovery is not only as fast as possible, but that it is aligned with helping finance the investment needed for the structural transformation to more inclusive, dynamic and low carbon economies.

Function (ii), i.e. promoting innovation and structural transformation, is particularly important in the context of this Policy Brief, but so are other roles. Function (i) makes development banks an additional instrument of counter-cyclical macroeconomic policy that, as pointed out, helps sustain investment when economies slow down or decline, key for avoiding interruptions to structural transformation. The significant counter-cyclical role of NDBs is a valuable complement to counter-cyclical fiscal, monetary and financial regulatory policies and function (iii) makes them an instrument of infrastructure financing, which both support indirectly, but importantly, structural transformation. Promoting small start-ups or SMEs that link to them, as part of the broader objective of financial inclusion, i.e. function (iv), may be essential for structural change. And many of the activities associated with mitigating and adapting to climate change, included under function (v), are innovative activities on their own. Finally, function (vi), which targets aligning the Covid-19 recovery with structural transformation, is naturally essential, as well as challenging. But we will look in particular at the function of development banks as promoters of innovation and structural transformation.

The failure of private financial markets to deliver adequate funding in a stable manner, at sufficient maturities to fund long-term investment, and at reasonable cost in local currencies, has led many governments to increasingly rely more on NDBs. Private finance is particularly insufficient for funding smaller and newer, especially more innovative companies, as well as providing sufficient funding to key and major new projects/sectors/missions with major uncertainty, essential for structural transformation. This uncertainty further increased in Covid-19 times.

The importance of these NDBs is a crucial feature of financial sectors in successful emerging economies, where the case of China is particularly relevant, but also of successful developed countries, notably Germany, and increasingly in practically all European countries. At the time of writing (September 2021), the US is discussing in Congress the creation of a federal green bank to facilitate the climate transition, but also focused on greater support for poorer regions and communities. Development banks had previously been given a major impulse with the creation of the China-led Asia

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Infrastructure Investment Bank (AIIB), as well as the New Development Bank (NDB), also known as BRICS bank – both based in China – as large and important new development banks, and the increased role of the EIB, both in the EU recovery post Eurozone debt crisis and even more so post Covid-19, as well as playing a key role in the EU Green New Deal.

As regards the role of NDBs in structural transformation, the emphasis is on the especially valuable role that development banks can play to fund investment in the beginning of new sectors and the innovative deepening of existing sectors/companies/missions, where private investment on its own would not invest, as it is too uncertainty averse. In those cases, development banks can provide the vision – and part of the resources – to do those things that at present are not done at all (Keynes, 1926; Mazzucato, 2013).

This requires development banks to have the expertise and the strategic vision to fund new sectors and technologies. The fact that development banks can provide long-term loans, have a long-term development perspective, as well as require lower returns further facilitates this. Development banks can also accumulate their own expertise, which they can transmit to investors and borrowers, as well as promote development in key activities via funding. Thus, development banks can combine and help to fill both gaps in knowledge and in resources. This is probably one of the most valuable roles for development banks.

The counter-cyclical role is crucial to help sustain investment, innovation, job creation and growth in the long periods when private lending falls or, worse dries up. Uncertainty of funding, accompanied by lower demand, can be a major discouragement for private investment, unnecessarily prolonging stagnation or low growth. Development banks can step in to help with both.

More broadly, there is a different case in favour of development banks, in the sense of the benefits of diversification. Having a more diversified financial structure than one just focused mainly on private (often large) banks and capital markets may have several advantages. Firstly, it may encourage competition between different types of financial institutions, which could enhance their efficiency, for example in the spreads they charge. Secondly, a more diversified financial system, especially if not having inter-connected risks, could lead to less systemic risk and therefore contribute to financial stability. Thirdly, if different varieties of financial institutions have different strengths, having a more diverse system could make fulfilling the functions that the financial sector needs to have to help achieve the structural transformation needed for inclusive, sustainable and dynamic growth more likely than if the structure of the financial sector is dominated by one type of financial institutions, whether private or public. Indeed, given that financial sectors (particularly liberalized, very lightly regulated ones) can be very problematic for growth, it is especially important to pursue pragmatic policies in financial sector development, and not be driven by pure free market ideologies or conditioned too much by the interest of agents in the private financial sector. This is well illustrated by the recent evolution of the Chinese financial sector, particularly as regards the China Development Bank, as well as China's other development banks.

It is important that NDBs can and should assume “economic risks” related to the uncertainty of going into new sectors, new technologies, new markets, which support a major structural transformation. However, NDBs should avoid assuming “purely financial risks”, by using instruments that are attractive

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for the private financial sector, but imply potentially high risks for the NDB. Thus, the instruments that NDBs chose to use should be evaluated mainly according to their development and structural transformation impact (Griffith-Jones et al, 2020b). A preference for simple and transparent instruments, like “plain vanilla loans”, including direct loans by the NDBs (rather than indirect loans, channeled via private banks), or simple equity contributions seems justified in many cases. Direct loans and direct equity instruments are particularly valuable for achieving the greater policy steer (or industrial policy) to channel resources into new sectors or activities required for structural transformation (Griffith-Jones and Naqvi, 2020). Equity or equity-like instruments have the advantage that they can allow development banks to be compensated for the higher risks they assume, e.g. in helping develop and fund new sectors and/or technologies by receiving a part of the “upside” if profits are high. Such capturing of parts of the “upside” of profitable projects can generate profits that the development bank can plough back into new future activities, via for example increasing its capital. As we discuss below, the China Development Bank has been deploying such instruments in a very interesting way.

## 4. Conditions for development banks to support structural transformation

Broadly, from research undertaken, it can be concluded that NDBs have been broadly successful and efficient instruments in achieving their roles, and particularly in helping achieve structural transformation (see Griffith-Jones and Ocampo, 2018, for example). NDBs have been in many cases innovative in what they do, by for example supporting innovation in and into key and new sectors, such as renewable energy. Here, the case of CDB is very important to highlight. Building on the experience of solar energy developed particularly in Germany, with the support of the German development bank, the Kreditanstalt für Wiederaufbau (KfW), CDB helped develop the policy framework and fund the major investment in solar panels made in China. The innovations introduced and the large scale of the investment implied a major reduction in the cost of solar panels. These CDB actions benefited not just Chinese consumers and producers but helped make solar energy far more competitive with fossil fuel-based energy worldwide, with a very important externality for mitigating climate change, as well as reducing the cost of electricity.

A number of conditions, both relating to the NDB itself and to the broader policy environment, need to be met, to ensure that NDBs can effectively and sufficiently contribute to the task of structural transformation.<sup>1</sup>

### (a) Related to NDBs themselves

First, governments should ensure that existing NDBs have sufficient scale to perform their functions well. Increased further by the needs posed by Covid-19 caused serious economic disruptions, as well as the challenge of helping fund the recovery from the pandemic, and especially given the major challenges of structural transformation, existing NDBs need significant capital, to ensure sufficient

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<sup>1</sup> This section draws on the conclusions of the research on NDBs, including on the Chinese Development Bank, which resulted in the book by Griffith-Jones and Ocampo, 2018, as well as the research programme prepared for the IDFC First Summit on Development Banks, and on the brief paper by Griffith-Jones et al. (2020c) synthesizing the research in the 15 research papers prepared.



scale of operations and sufficient impact. The case for the need to increase capital in NDBs, and thus scale is particularly strong in countries and regions, (especially in sub-Saharan Africa and Latin America) where levels of investment are too low, especially investment related to the major structural transformation needed to achieve more dynamic, greener, smarter and more inclusive economies, and NDBs can play key roles to help fund such essential investment. The large scale of Chinese development banks (especially CDB) discussed below, illustrates the importance of sufficient scale to achieve significant effects. Furthermore, countries, especially developing ones, without an NDB, urgently need to consider establishing one.

It should be stressed that increasing the scale of NDBs, or creating a new one where NDBs do not exist, does not require a large scale of government resources, as the only or main fiscal contribution would be an increase in paid-capital. Then, those countries could fund their operations on the private domestic capital market, as is the case of CDB. For those countries which do not have sufficiently deep capital markets to do so sufficiently, NDBs can help deepen and develop domestic capital markets, as again the case of CDB illustrates. International capital markets, as well as MDBs and RDBs can provide additional resources, even though international borrowing does pose the potential problem of currency mismatches, when activities financed are produced for, and sold in, domestic markets and currencies.

Secondly, most NDBs need to have and improve the analytical tools to monitor and evaluate the impacts of their financing. These banks' safeguards, including on the environmental and social impact of their investments, are valuable. But they must do more to incorporate the imperative of the transition to equitable, low-carbon, and dynamic economies into all financing decisions and project stages. The use of "shadow prices" for example for carbon seems to be a valuable tool for project evaluation, which should be considered by NDBs.

Third, NDBs should aim to shape the future, and move from being mere "project-takers" to "project-makers." Once they have defined goals in their structural transformation, they must play a proactive, first-mover role to help overcome uncertainties and risks, and define missions, programs, and projects.

As a fourth priority, NDBs should do more to combine their resources with those of the private sector and help to mobilize commercial financing for projects that the market alone often will not fund. This is particularly the case in countries with quite deep capital markets. Where such deep capital markets do not exist or are not deep enough, NDBs themselves can help their development, as CDB clearly did. Channeling resources from the private financial sector via NDBs can bring all actors together to maximize impact in the context of sustainable development objectives. However, care must be taken so that NDBs help catalyze significant private flows for financing priority sectors/projects but do not provide excessive guarantees or subsidies to the private financial sector, to avoid excessive contingent liabilities for NDBs.

Finally, maximizing NDBs' effects on development requires them to focus on the real economy and invest in innovative, high-impact projects. The instruments they use need to be tailored to maximize the impact on structural transformation and development of these transactions. NDBs mainly extend loans, both first tier (direct) and often increasingly second tier (indirect usually via private financial intermediaries). But the role of direct loans by NDBs needs to be encouraged more than in recent

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years, particularly to facilitate policy steer for larger projects in key areas, which are crucial for structural transformation. Guarantees may play a useful role in managing financial risk in times of high uncertainty such as is frequent in investment for structural transformation, as well as in times of crises, such as the current Covid-19 pandemic. However, the excessive use of guarantees may weaken the ability to have policy steer. And for innovative, high-risk technology projects with potentially high development and profit potential, NDBs should consider using more equity or quasi-equity instruments in order to capture upside gains (that can be channeled to increase the capital of the NDB, and thus expand its activity), as well as having greater potential for policy steer.

(b) Related to the broader policy environment

The broader policy context in which NDBs operate is also key for them to be more successful.

Firstly, good macro-economic policies – in particular active counter-cyclical fiscal and monetary – as well as an emphasis on maintaining competitive exchange rates are important for the success of NDBs.

Secondly, a well-functioning financial sector is also an important pre-condition for the smooth functioning of an effective NDB. As mentioned, NDBs can help develop a deeper and better capital market. CDB played a key role in the development of the Chinese bond market. More generally, a number of NDBs helped to introduce local-currency and/or green bonds in their own local capital markets.

Thirdly, financial regulators may need to tailor their prudential rules (for example in the risk treatment of long-term loans by NDBs, and concentration risks in them) to account for specific features of NDBs – like that they have typically long-term sources of funding – and their main purpose, contributing to development and structural transformation (Barros de Castro, 2018). The latter will also improve future financial stability.

Finally, and very importantly, an NDB can operate particularly effectively if the country has a clear development strategy, ideally linked to a modern industrial policy broadly defined, to include promoting innovative sectors and activities, in natural resources and the addition of valued added to them, manufacturing, infrastructure, agriculture and services. Furthermore, an NDB operates best if it has a clear policy mandate from the government, though having operational independence to fulfil this mandate. NDBs seem to operate best if different governments do not change such mandates too much, allowing more continuity and long-term planning by the NDB in their support for structural change and development, as is illustrated by the case of Germany (Moslener et al, 2018). Naturally, a change in the structural transformation needs of a country requires a change in the mandate of its NDB.

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## 5. Some lessons from Chinese NDBs; the case of CDB

### (a) Scale

As pointed out above, the three major Chinese NDBs (CDB, the Agricultural Development Bank (ADBC), and the China Export Import Bank (EIBC)) have assets worth US\$ 3.7 trillion, representing 32 per cent of the world total assets of all development banks. Furthermore, the CDB is by far the largest development bank in the world, with assets of US\$ 2.6 billion for 2020. It is also the largest NDBs in the world in terms of assets as a share of its country's GDP, which for CDB reached almost 18 per cent (data based on CDB Annual Report and Financial Statement and World Bank, for Chinese GDP). This large scale has contributed to CDB having a major impact on the Chinese national economy, as well as internationally.

### (b) Coordination with strategic planning, at different levels

CDB plays an important role in Chinese strategic planning and helps, where relevant, to develop the policy framework (Chen, 2013; Xu, 2018). Thus, CDB is actively involved in the five-year plan at both the national and regional level, which means that it is involved in planning in many provinces and cities. CDB has often led the development of certain sectors, such as solar energy. Furthermore, CDB nurtures the creation of a pipeline project pool that takes into consideration tendencies in global development, national growth strategies, as well as regional and sectorial plans. It has thus also helped to bridge the gap between central government plans with regional and local plans (Xu, 2018).

### (c) Key role in developing new sectors and instruments

One example of CDB developing new sectors and instruments was its support for the creation of financial markets that finance investment in urban infrastructure initially with the municipal government of Wuhu, but then extensively applied across the country by CDB (Xu, 2017). CDB initially decided to collaborate with the provincial government and the Wuhu municipal government to explore new ways of financing urban infrastructure. Accelerating industrialization and urbanization in the city of Wuhu demanded large-scale long-term infrastructure financing at the time.

At the heart of the so-called Wuhu model were three key ingredients. First, CDB collaborated with local governments to leverage the future value of land into large up-front urban infrastructure loans. Second, CDB persuaded the local government to establish a unified local government funding vehicle (LGFV), to mitigate credit risks and help incubate independent legal entities for loan repayments. Third, CDB bundled urban infrastructure projects with different levels of profitability to systematically improve urban infrastructure. As the Wuhu model was extended to other provinces and municipalities of China, CDB also adapted the model.

Both for Wuhu and, as the model became generalized by CDB, later also for other cities and regions, CDB finance supported a basket of infrastructure projects, such as highway and subway construction, watershed management of rivers and urban landscaping. Building on the development of this fully equipped infrastructure, achieved by the collaboration of CDB and local institutions, there was a

remarkable improvement in urban infrastructure, which led to booming construction, building materials, tourism and car manufacturing. This contributed to a remarkable tenfold increase in per capita income in a period of seven years in Wuhu (Xu, 2018).

It should be mentioned that the rapid increase in local government debt generated by LGFV implied the need to modify and regulate this model. However, at a particular stage, it helped provide significant additional resources and facilitate major infrastructure construction, with very large development impact. In some developing countries, like Ethiopia, a similar approach to that which had been adopted by CDB, relying on planning first, land financing and bundling loans, contributed also to achieve rapid development.

More recently, CDB has played a similarly, and very valuable major role in the development of solar energy, as mentioned above. Building on the advances in other countries, like Germany where the NDB KfW had initiated and then catalyzed major investment in solar panels and solar energy, CDB helped develop the policy framework for further developing the solar panel industry in China and helped fund it at a massive scale. Both the technological improvements introduced and the extremely large economies of scale implied by that large investment, which benefited from considerable financing from CDB, led to a massive decline in the cost of solar panels, which made solar energy increasingly competitive with fossil fuel electricity, and facilitated the major expansion of solar energy, both in China and worldwide. This represents an important structural change leading to lower carbon emissions. Thus, a major positive environmental externality was introduced at a global level, to an important extent thanks to the actions of CDB, as well as the Chinese Government. The spreading of investment in solar energy worldwide has been also further facilitated by CDB providing climate energy financing internationally (Kong and Gallagher, 2017).

A final area where CDB has played a key role is in financing innovation in China both in financing sci-tech micro, small and medium-sized enterprises (MSMEs) and large-scale technological R&D (Xu and Guo, forthcoming). As widely recognized, Chinese capabilities of innovation have increased impressively in the last few decades both in the field of basic research, and in the field of technical innovation. The nature of innovation has also evolved, reflecting new needs. Thus, innovation in traditional industries has drastically shrunk, while sectors designated as “emerging industries of strategic importance” – such as information technology, biology, and high-end equipment manufacturing – have become increasingly important in innovation.

Bank loans in China are still a major source of funding for sci-tech MSMEs, accounting for 70 per cent of all funding. However, commercial banks are unwilling to fund sci-tech MSMEs. NDBs, and especially CDB, therefore play a vital role in providing lending and crowding-in private capital for MSMEs. As for the major innovation projects prioritized by government strategy, a large portion of Chinese mission-oriented investments in innovation is funded by CDB. Indeed, supporting innovation-driven strategy is one of the priorities of CDB. Using financial instruments like the “emerging industries of strategic importance loan” and the “investment and loan linkage mechanism”, CDB is able to meet the needs of innovation, via interesting instruments.

In October 2010, when the seven “emerging industries of strategic importance” were officially defined as energy saving and environment protection, new generation of information technology, biology,

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high-end equipment manufacturing, new energy, new material, and new energy vehicles, CDB started to focus part of its' loans on these sectors via its "emerging industries of strategic importance loan". Up until 2018, the "emerging industries of strategic importance loan" accounted for over 10 percent of CDB's outstanding loans.

More recently, the "Investment and Loan Linkage Mechanism (ILLM)" instrument was designed to help deal with the difficulty sci-tech MSMEs have in raising funds due to their very sci-tech nature. CDB was chosen as one of the pilot banks for this instrument. Young start-ups, particularly those venturing into areas where no previous example exists to herald its success, often have no collateral but their patents, and thus bear a significant level of risk. Commercial banks are therefore unwilling to lend. ILLM is defined as "the practice that combines the credit from a banking financial institution and the equity investment from its subsidiary that performs investments, (and CDB already had such a subsidiary) in order to make up for the risk of the credit with the profit from the investment, and thus successfully match the risk and profit of the credit for hi-tech corporations, and provide lasting financial support for hi-tech corporations" (Xu and Guo, forthcoming)

ILLM builds on the strengths of other existing financing models of sci-tech MSMEs, such as bank credit, equity-plus-debt carried out separately by a commercial bank and an external investment company, and venture debt, by combining them in a creative way, particularly suitable for developing countries.

Compared with bank credit, ILLM can add to the banks' profitability from the start-ups through its equity investment. This enables Chinese banks like CDB to "capture the upside" (Griffith-Jones and Carreras, 2021), so that if a project is profitable it can generate profits for CDB, which can thus increase its capital and future operations. Furthermore, the profit generated by successful projects helps compensate the losses made by the unsuccessful projects, as these innovative projects are high risk.

## 6. Brief conclusions and policy recommendations

There has been a renaissance of NDBs both as a result of their valuable counter-cyclical role post the 2007/09 financial crises and the Covid-19 crisis, and their increasingly crucial role for structural transformation, essential for long-term development, as well as for making this development inclusive, dynamic and environmentally sustainable. Development banks are already large in scale worldwide, and they are increasingly seen as broadly effective for achieving their important roles.

To make NDBs even more effective, it is key that they have sufficient scale, to maximize their development impact. This crucially requires governments to provide sufficient paid-in capital. This can be complemented by NDBs also funding themselves on local capital markets, where these are deep enough, to provide additional leverage to fiscal resources. Those countries that do not have a NDB should seriously consider the benefits of creating a NDB

Furthermore, NDBs will be most effective for structural transformation if they operate in the context of a clearly defined national development strategy, and within which they are allocated a clear and strategic mandate, especially in their contribution to structural transformation.

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There is a rich experience of NDBs and many lessons can be drawn from this experience. Of significant relevance is the positive experience of CDB and its important role in supporting China's successful economic development and structural transformation. One key aspect to highlight is its large scale, as it is not just the largest NDB in absolute terms, but also in proportion to the size of the Chinese economy. A second key aspect is the key role it has played in the structural transformation and rapid development of the Chinese economy.

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