

# Governing finance to support the net-zero transition: Lessons from successful industrialisations

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# Governing finance to support the net-zero transition: lessons from successful industrialisations

Olga Mikheeva\* and Josh Ryan-Collins\*\*

## Abstract

The transition to a net-zero carbon economy requires a major shift in financial flows. Financial policy bodies — central banks, financial regulators and ministries of finance — clearly have a role to play in supporting such a shift. Up until now, policy discourse has envisaged this role primarily as one of enabling and de-risking private finance, via support for new ‘green finance’ markets and instruments (e.g. green bonds, sustainability taxonomies and ESG derivatives) alongside encouraging the disclosure of climate-related financial risks to support effective price discovery in financial markets. Historically, however, financial policy bodies have played a more direct and coordinative role in industrial and economic development, often via close collaboration with dedicated public financial institutions such as national development banks. This paper examines the governance of industrial credit and capital market financing in six countries — Mexico, Canada, Norway, Japan, Korea and China — which successfully and rapidly industrialised at different periods in the 20th century. We examine how central banks and ministries of finance coordinated financial policy to achieve rapid structural economic change, and consider the implications for the net-zero carbon transition.

**Keywords:** financial governance, financing of industrialisation, central banks, development banks, ministries of finance, green transition, net-zero carbon transition

**JEL codes:** E61, E63, E65, G21, G23, G28, O23, O25

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## 1. Introduction

The transition to a net-zero carbon economy requires a major structural transformation of economic activity which will need substantial new financing. A recent estimate found that clean energy-related investment will need to reach \$4 trillion annually by 2030 from around \$1 trillion now (WEO 2021: 48) to achieve net zero by 2050. The European Commission has estimated that to achieve an interim greenhouse gases reduction target of 40% by 2030 would require €260 billion of additional investment a year within the EU, over €1 trillion over the decade (EU News 2020). At the same time, unsustainable sources of financing need to be rapidly phased out. In a recent landmark report, the International Energy Agency (2021) recommends that, from 2021, no new unabated coal plants and no new oil and gas fields should be approved for development.

Financial policy bodies — central banks, financial regulators and ministries of finance — have a key role to play in supporting this major shift in financial flows. In 2017, the Network for Greening the Financial System (NGFS), a network of central banks and financial supervisors, was established to help strengthen the global response required to meet the goals of the Paris Agreement and to 'enhance the role of the financial system to manage risks and to mobilize capital for green and low-carbon investments in the broader context of environmentally sustainable development' (NGFS 2017). Almost 100 institutions are now members, including all of the world's major central banks. The Coalition of Finance Ministers for Climate Action also stated in its Santiago Action Plan (2019) that achieving low-carbon transition requires structural economic changes and that finance ministries are well positioned to play a leading role by wielding fiscal, economic and planning instruments to develop long-term transition strategies (Ministry of Finance of Finland 2019).

However, the emerging consensus is that financial policy bodies should focus on the creation of an enabling policy environment for private finance to lead this transition. This involves, firstly, attracting in new sources of capital, in particular institutional investors, via de-risking projects, catalysing new markets and creating new financial instruments such as green bonds or green taxonomies (World Bank and IMF 2015, 2017; G20/OECD/World Bank 2018; NGFS 2019; IRENA, undated; European Commission, undated). Secondly, on the financial regulation side, central banks and financial supervisors have pushed for greater disclosure of climate-related financial risks by banks and asset managers to correct the perceived failure of markets to price in such risk (TCFD 2017; NFGS 2019). In a similar vein, the Helsinki Principles, which set the guidelines for finance ministers to facilitate the green transition, focus on carbon pricing, mainstreaming climate change mitigation and adaptation in macro-fiscal and related (budgeting, procurement, public investment management) policies, and 'greening' financial sector development as key policy mechanisms (Coalition of Finance Ministers for Climate Action 2019).<sup>1</sup>

As yet, however, the results of this market-led strategy have been disappointing, with little evidence that the private sector (or public sector) have adjusted their activities sufficiently to reach net zero by 2050. For example, current announced pledges relating to investment by the public and private sector lag significantly behind the aforementioned \$4 trillion-by-2030 clean energy

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<sup>1</sup> See Steffen (2021) for a recent survey of financial policies supporting the green transition in OECD countries.

goal, needing to be around three-quarters higher (WEO 2021: 48). To be clear, there would certainly appear to be sufficient private finance available, with 450 leading financial institutions from 45 countries at the Glasgow COP26 signing up to managing assets totalling \$130 trillion in line with achieving 1.5C. The problem is actual investment alongside disinvestment from fossil fuels.

In the light of this, what lessons can we learn from 20<sup>th</sup> century history in relation to the governance of finance to achieve rapid structural economic change? (We define change as 'in the long-term composition and distribution of economic activities' (UNIDO 2018)). In this paper we undertake historical analysis of six cases: Japan, Korea, China, Mexico, Canada and Norway.<sup>2</sup> These six countries display considerable heterogeneity in terms of socio-economic, cultural and historical factors that define the diversity of national political and administrative structures, but all six countries were successful in achieving industry-led structural change. This is illustrated, for example, by: 1) the share of manufacturing steadily increasing, including due to internal demand; and 2) changes in the composition of trade, with exports of intermediate goods and imports of capital goods increasing, while imports of consumer and intermediate goods decreased.

We focus on three main elements in each country: 1) the role of dedicated industrial financing public bodies, their aims and governance; 2) policies that steered financial credit and capital towards industrial policy objectives; and 3) how policy coordination was achieved and what challenges this created.

We find that in all cases ministries of finance, central banks and financial supervisors played a more direct and coordinative role in industrial and economic development than under the market-led strategy being pursued to support today's green transition. Notably, financial policy was aligned with industrial policy objectives via a range of tools and institutions. These included quantitative and price-driven credit policies, in particular via continuous policies of stimulating credit access for manufacturing firms while controlling the flow of finance to consumption-oriented sectors (including real estate and consumer durables). In addition, there were controls on corporate and government bond markets (including capital controls). Specialised agencies, such as national development banks and other public financing institutions, were created, alongside specific institutions focused on the co-ordination of fiscal, financial, monetary and industrial policy. In other words, financial governance was based on an overarching consensus around the main objective of economic governance (i.e. industrialisation) and financial markets were directed towards achieving this goal through a great variety of policy mechanisms.

The remainder of this article is structured as follows. Section 2 considers the existing literature on financial governance for economic development; and outlines the current financial policy framework for supporting the net-zero carbon transition, its underlying assumptions and its limits.

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<sup>2</sup> We deliberately selected countries with lower levels of initial industrial development — that is, with a less established industrial base and weaker or absent financing of industries — because these factors resemble the current situation with the green transition, which is characterised by a lack of established green sectors and weak investments. For this reason, we omitted, for example, France, where centralisation of industrial credit was very strong during the post-war period, as epitomised in the creation of the *Conseil National du Cr dit*.

Section 3 is the six case studies. Section 4 discusses the findings and considers policy lessons for financial policy bodies seeking to support the net-zero carbon transition. Section 5 concludes.

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## 2. Governing finance to support economic transitions

### 2.1 Financing of economic development and industrialisation in the 20th century

As with decarbonisation, financing of economic development generally involves considerable uncertainty, which adds to the inherent fragility that characterises financial systems (Minsky 1986). Economic policies that aim to develop a competitive advantage by establishing new industries and upgrading existing ones require investments into activities and sectors with economic and technological ‘unknowns’ (Burlamaqui and Kregel 2006; Kregel and Burlamaqui 2005; also Burlamaqui and Kattel 2016). Debt finance (bank loans and corporate bonds) collateralised by borrower assets can reduce the level of risk for the creditor. However, such collateral assets can themselves be subject to financial volatility, as was seen in the financial crisis of 2007–08. These dynamics constitute a *prima facie* case for public sector involvement in the financing of industrial policy goals (Stiglitz 1993).

Up until the 1980s governments dealt with the challenge of uncertainty via direct intervention in financial markets through a variety of policy tools. Substantial capital controls and protection of domestic banking sectors, controlling interest rates and improving access to credit for domestic industrial sectors, soft-loan schemes and direct lending to industries on favourable terms, and encouraging higher rates of savings amongst the population were all commonplace. These quantitative and qualitative controls over credit creation and allocation were seen as essential for industrial development (Bezemer et al 2021). Indeed, successful industrialisation policies in the 20th century involved a targeted approach to structuring and directing finance towards productive sectors, both in developing and developed countries (Loriaux et al 1997; Amsden 1989; Wade 1990; Weiss and Thurbon 2004; Thurbon 2016).<sup>3</sup> In a contemporary context, Weber (2021) also refers to ‘policy experimentation’ when describing China’s gradualist and targeted approach to market reforms.

Governance of industrial credit was centred over the objective of supporting productive investments with high technological and social returns while simultaneously limiting investments in consumption, such as real estate and consumer durables. According to Stiglitz (1993), credit allocation policies were seen as the most effective policy levers in developing countries since fiscal space was limited with foreign exchange scarce. For Calder (1993) and other scholars of post-war economic development, particularly in East Asia, governance of industrial finance was a

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<sup>3</sup> The report *Development Banking in the New Millennium* by the Development Bank of Japan and Japan Economic Research Institute (1999) is particularly relevant, arguing that financial policy played a significant role in East Asian industrialisation, as well as the well-established export-oriented and protectionist growth strategy, as discussed, for example, in the World Bank’s *East Asian Economic Miracle* (Stiglitz 1993) report. More recent studies pay more attention to financial policies and financing agencies (e.g. Calder 1993; Werner 2003; Thurbon 2001).

very concrete mechanism for directing resources in support of national priorities (Calder 1993: xix). Studies of 'catching up' industrialisation in East Asian 'tiger' economies provide valuable accounts of industrial and financial policy coordination (Johnson 1982; Amsden 1989; Amsden and Chu 2003; Wade 1990; Evans 1995), although financial policies are typically analysed as subordinated to economic planning since performance targets were typically expressed in industrial (technology and/or export performance) and not financial terms (Amsden 1989).<sup>4</sup>

This was also reflected in coordination between key financial agencies: typically, ministries of finance were the leading agency with central banks having quite limited independence from governments. At the same time, such arrangements were characteristic of the post-Second World War financial architecture and Bretton Woods institutions, inspired by Keynes, whereby centralised control over economic policies was exercised by elected officials and fiscal, financial and monetary policy were coordinated to influence aggregate demand towards the achievement of reconstruction, full employment and expanded welfare states (Lie 2019). As part of this Keynesian consensus, from the 1930s–40s central banks were also increasingly seen as playing an active role in supporting economic development (Ali 1962; Epstein 2015; also de Carvalho 1995; Wray 2007; UNCTAD 2020). This was particularly prominent in developing countries, but no less important in continental Europe, Japan and to some extent in the USA and the UK, in the case of the latter especially in relation to promotion of the financial sector (e.g. Epstein 2006; Loriaux et al 1997).

The growing role of governments in industrial credit provision corresponded with establishment of state-owned investment banks (SIBs) to help finance industrialisation by providing long-term credit, particularly after the Second World War (Armendariz de Aghion 1999). While in most cases these SIBs were part of the ministry of finance or ministry of industry, they also coordinated or were closely associated with central banks. This involved, for example, guarantees to cover foreign exchange risks (for technology imports); foreign currency transactions (effects on the national balance of payments<sup>5</sup>); and administered interest rates and soft-loan schemes. Close relations between a central bank and a SIB were seen as beneficial for a number of reasons: they could help solve the problem of a shortage of long-term industrial finance (whereby a central bank plays the role of the 'lender of last resort'); a central bank can direct industrial credit to priority sectors thereby reinforcing the impact of SIB activities and crowding in commercial finance; and close collaboration with an SIB can help the central bank transmit 'developmental objectives' to commercial banks and other financial institutions (often SIBs co-lend with private banks) (Leembruggen<sup>6</sup> 1970, 360).<sup>7</sup>

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<sup>4</sup> Interestingly, recent literature on 'modern industrial policies' equally does not refer to 'modern financing policies' either (e.g. Felipe 2015), while detailed studies on the holistic approach to innovation only emphasise early-stage funding and R&D support (e.g. Borras and Edquist 2019; Owen et al 2018).

<sup>5</sup> This is especially relevant for the initial phase of industrialisation when foreign currency is particularly scarce. For example, foreign borrowings by Korea Development Bank were closely monitored (Song undated), while Mexico's Nafinsa acted as the sole intermediary for all public sector foreign borrowings (Blair 1964).

<sup>6</sup> The then general manager of Malaysia Industrial Development Finance, Malaysia's industrial development bank (est. 1960).

<sup>7</sup> Examples of direct relations include the Industrial Bank of Canada (est. 1944) and the Industrial Development Bank of India (est. 1964), which were established as subsidiaries of their respective central banks. Australia's Commonwealth Bank (the forebear to the central bank) also had the Industrial Finance Department as a subsidiary from 1946–1960, until

The period of more direct and coordinated financial policies lasted from around the 1930s, when governments started assuming larger roles in economic governance, until the 1970s, when proponents of liberalisation and the so-called Washington Consensus produced several influential publications arguing that 'repressive' financial policies were the cause of poor economic performance (Shaw 1973; McKinnon 1973). It was argued that the state-directed allocation of capital results in distorting the pricing of capital and hence the sub-optimal allocation of resources. By controlling interest rates and restricting activities on capital markets, governments discouraged bankers and investors from managing credit and investments in a market-efficient way. This led, it was believed, to many poorly performing projects being selected for investments (ibid; also Alexander et al 1995; Fry 1995; Bezemer et al 2021). These conceptual developments resulted in a gradual shift in how we understand economic and financial governance and, more importantly, its overall policy objectives. The next section elaborates on this turn towards the market and the ideational foundation of current market-led policies of the green transition.

## 2.2 The market-led response to greening finance and its limits

Since the 1970s, macroeconomic and financial (henceforth macro-financial) policy has been viewed as primarily concerned with economic and financial stabilisation rather than industrial or economic development. Active fiscal policy — government spending and public investment — is viewed as necessary only in the short run as a countercyclical instrument (Tobin 1975), while market forces and the price discovery mechanism — unhindered by rigidities and frictions — are presumed to lead to a full-employment equilibrium in goods, capital and labour markets in the long run (Woodford 2003). Unconstrained competitive financial markets, which are assumed to price capital in line with capital scarcity, permit credit to flow to those able to pay the highest risk-adjusted interest rates and use resources most productively (Alexander et al 1995, 15).

Under such conditions, central banks and related financial authorities should not concern themselves with the allocation of finance and long-term growth but focus on maintaining price stability and in particular helping the economy move towards its equilibrium 'natural' rate of interest at which markets would clear and at which the inevitable trade-off between inflation and employment would be optimised (Woodford 1995). To prevent macro-financial policies becoming subject to government failure, an externally imposed rules-based framework is advisable, with discretionary interventions undesirable (Blinder 2004). Thus, fiscal policy is constrained by the 'discipline' of budget deficit targets, and central banks are limited by tight mandates oriented towards price stability above and beyond other goals, including industrial policy and economic development objectives. There has also been a shift towards granting financial regulators and supervisors greater operational independence from governments for similar reasons (Quintyn and Taylor 2002), a process that gained momentum after the financial crisis of 2008.

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it was transferred to the newly created Development Bank of Australia. Often central banks administered 'earmarked' funds established by the government, whereby financing was channelled through development banks in the form of soft loans (with preferential interest rates) to priority sectors (Mikheeva 2018). At times, central banks even provided financing directly to non-financial firms: the Bank of England and *Banca d'Italia* were both involved in direct management and financing of industrial firms before the First World War (O'Connell 2012 in UNCTAD 2013).



The above developments help explain why when it comes to the green finance agenda, policy makers have assumed that the bulk of forward-looking low-carbon investments, for example in renewable energy, must come from the private sector. It is – explicitly or implicitly – assumed that the public sector cannot afford the huge scale of the investments required, nor is capable of allocating such capital efficiently. Rather, the public sector's key role is to provide *enabling* policy framework conditions, i.e. to de-risk and catalyse new markets and to mobilize new capital sources. Domestic central banks and financial supervisors and international organisations have shown a remarkable alignment on this agenda (World Bank and IMF 2015, 2017; G20/OECD/World Bank 2018; NGFS 2019; IRENA, *undated*; Coalition of Finance Ministers, *undated*). Great effort has been made to support the development of new green financial instruments, in particular green bond markets and green impact loans, along with green derivatives and green futures, in order to make low-carbon sectors more 'investable' (Lund Larsen 2019; Dafermos et al 2021).

In the financial regulation sphere, sustainable finance frameworks, such as the Taskforce for Climate-related Financial Disclosures (TCFD), are founded upon the concept of market-failure, whereby a lack of information leads to the mispricing or non-pricing of environmental externalities in financial markets (Campiglio 2016; Christophers 2017; Chenet et al 2021). Central banks and financial supervisors have adapted and built upon this approach in more recent times via the development of climate finance 'scenario analysis' and climate stress testing as a means of internalising risks and guiding financial markets towards a smooth transition (TCFD 2017; NGFS 2019a, 2020c). The G7 Finance Ministers embrace a similar approach, emphasising carbon pricing and climate-related financial disclosures (G7 2021). The newly established Taskforce for Nature-related Financial Disclosures (TNFD), with greater focus on the financial risks posed by biodiversity loss, will also operate along the same lines (TNFD 2021).

As with structural economic development, climate change and the necessary structural transition to mitigate and adapt to it creates fundamental uncertainty, whereby the probabilities of different outcomes are impossible to calculate in advance (Chenet et al 2021; Bolton et al 2020). This uncertainty is a consequence of the endogenous interaction of policy and regulatory change, technological innovation, changing consumer preferences in the real economy and the highly interconnected global financial system which propagates and amplifies such risks rather than containing it within particular institutional, sectoral or spatial domains. This creates limitations in addressing climate change and the financing of green investments through the aforementioned market-enabling mechanisms.

It means, firstly, that the key challenge when it comes to industrial and economic transition and innovation is not the *amount* of finance but the *type* of finance needed. For the climate crisis, long-term, patient, risk-welcoming capital is required to fill the investment gap in new green infrastructure; in existing technology such as the renewable energy transition; and in yet-to-be-built technology such as carbon capture and storage (Mazzucato and Semieniuk 2017, 2018; Owen et al 2018). Typically, this type of finance is not provided by private capital markets that seek safe long-term returns, nor commercial banks with generally shorter time horizons, a focus on quarterly returns to shareholders and high-quality collateral (such as real estate).

Secondly, typical financial risk analysis is based on probabilistic methodologies and extrapolation from previous trends which are unsuited to conditions of fundamental uncertainty. This implies the need for a more (pro)active and direct role for financial policy makers, particularly central banks and financial supervisors, in shaping financial markets to encourage the shift to a net-zero carbon economy (Chenet et al 2021; Dikau and Voltz 2019, 2020). Financial governance bodies need to view themselves as key actors in shaping the trajectory of finance to meet the challenge of decarbonisation, rather than weather-forecasters whose primary role is to inform market actors about unforeseen risks but who can have no impact on it themselves (Ryan-Collins 2019).

Thirdly and relatedly, the market-enabling approach limits the scope for policy coordination between monetary, fiscal, industrial/innovation-related and environmental agencies. Industrial and innovation policy has a long-time horizon — it can take many years before public and private investments can bear fruit given the uncertainty involved in innovation-led growth and development (Mazzucato 2013). By reducing the role of fiscal policy to addressing short-run shocks to aggregate demand and insisting on monetary policy limiting itself to a focus on price stability and observing strict independence from government, such coordination becomes much more difficult and short-term oriented.

These challenges make it perhaps unsurprising that — as yet — there is little evidence that this market-oriented approach to greening the financial system has been effective. While there have been increases in the private sector financing of some green sectors, in particular renewable energy, much of this has actually come from public financial institutions, in particular state investment banks (Mazzucato and Semieniuk 2018). Meanwhile, climate-related financial disclosures are yet to materially affect investment decisions for the majority of investors and bank lenders (Ameli et al. 2019; BCAM 2019; IMF 2020c). Commercial banks, large investment banks and asset managers have significantly increased their financing of fossil fuel companies since the 2015 Paris Agreement and TCFD came in to being (European Central Bank 2020, 73).

A case can then be made that financial policy bodies — central banks, supervisors and ministries of finance — need to consider stronger interventions in financial markets to ensure coherence between economic and industrial policy. In many respects the green transition is similar to the challenges faced by governments pursuing industrialisation policies. This includes the uncertainty of investing into new economic sectors and the need to design (through trial and error) institutional arrangements that facilitate investment, enable structural change and create employment despite these higher risks.

Therefore, there is a strong case for looking at the history of industrial financing policy tools and the institutional arrangements that supported them. In the next section we focus on coordination of industrial finance in selected countries which experienced successful industrialisation and economic transformation in a short space of time: Japan, Korea, China, Mexico, Canada and Norway. While there are many factors that help explain these economies' 'economic miracles', their financial governance arrangements have been paid considerably less attention in the existing literature.

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### 3. Governing finance to support industrial and economic objectives: case studies

The six case studies outlined below are structured as follows. In the first part, we provide an overview of the nature of the structural economic transition the countries undertook during the period under investigation. We then move in to examine the key government agencies, policies and coordination that were employed to enlist the financial system to support the transition. Finally, we examine more closely the role of the respective state investment banks. We summarise the findings in Table 1 at the end of the section.

#### 3.1 Mexico

##### Overview

Mexico experienced two remarkable periods of stable growth that were higher than in the neighbouring USA: the first, during 1877-1910, was characterised by foreign investments and development of the railroad system; and the second, during 1950-1981, was characterised by urbanisation and industrialisation (Kehoe and Meza 2011). The recovery after the Great Depression was already focused on industrialisation-led growth, which set the conditions for the subsequent 'economic take-off' period of the 1950s-70s (ibid). Indeed, the growth rate of manufacturing GDP in Mexico was at its highest during 1932-1938 (12.6%) followed by 9.2% in 1938-1945 (Gómez-Galvarriato and Márquez Colín 2017, 291-292) when exports were already diversified and currency devaluations stimulated manufacturing growth (Díaz Alejandro and Seibert 1979, 150).

The changes in Mexico's manufacturing structure included a steady increase in intermediate goods (from 15% in 1929 to 30% in 1980) and in capital goods (from 2% in 1929 to 17% in 1980) (Gómez-Galvarriato and Márquez Colín 2017, 299). Following the signing of the trade agreement with the USA (1942), and thanks to the war economy during the 1940s, Mexican public investment grew at the annual rate of 15%, financed by export revenues. The protectionist regime that followed the end of the Second World War and import-substitution policies, reinforced by devaluations in 1949 and 1964, further stimulated manufacturing growth that continued well into early 1980s (Gómez-Galvarriato and Márquez Colín 2017).

Mexico's industrialisation, particularly after the 1940s, was characterised by an interventionist central bank and active state development banks (Marois 2007). The state-led industrial growth during the 1950s-1960s was also financed through high reserve requirements on private domestic banks (in the form of holding government debt instruments or private corporations, as discussed below) — this policy was enforced in exchange for banning foreign banks from the Mexican market (Maxfield 1997). However, there existed a division among financial elites in regards to the task of controlling financial markets, specifically around the trade-off between the control of inflation and supporting activist credit policies. The nationalisation of commercial banks in 1982 reflected this long-standing division within the government: the declining capacity of the government to guide industrial investments was one of the reasons, in addition to capital flight

(ibid, 102). At the same time, Mexico's overall development strategy was largely built on a liberal currency exchange policy and later trade liberalisation, to which end it entered GATT in 1986 and NAFTA in 1994<sup>8</sup> (Santos 2013).

## Main agencies, credit policies and coordination

Strict controls over foreign ownership of banks and selective credit allocation intensified in the 1940s when differential rediscounting used by the *Banco de Mexico* (BdM) helped extend credit to private banks at interest rates that varied according to banks' lending activity. Differential requirements were imposed based on a private bank's liability and asset structures, and there were three types of reserve requirements: cash reserves, securities holdings and a direct credit requirement (*cajón*). *Cajónes* (boxes) were essentially lending quotas for specific types of borrowers. BdM had the power to raise the maximum reserve requirement to 100% of any increase in liabilities and marginal reserve requirements were adjusted more than 30 times during the 1950s-70s (Maxfield 1997). At times, specific securities were required to be held by commercial banks, e.g. bonds of the National Sugar Corporations or national highway bonds (Young 1962, 281). Conventional reserve requirements and special securities holdings represented a continuous policy of BdM towards commercial banks, which ensured the acquisition of government bonds and debentures of national credit institutions (Shelton 1964), similar to the model discussed below used by China in the 1980-1990s. Quantitative limits were set on the annual rate of growth of mortgage loans and on short-term liabilities by private *financieras* (private credit institutions encouraged to lend long term) by the central bank in 1958 (Shelton 1964, 168).

The primary motivation for the credit control programme by financial governance agencies was to control inflation. But this goal was in conflict with government agencies such as the Ministry of Agriculture and the Ministry of National Patrimony, which backed the credit control programme as a policy tool to support specific geographical and sectoral economic activities (Maxfield 1997). Private banks were reluctant to hold government paper while major banks were relatively liquid — under these conditions the rediscounting tool would not be effective to regulate money supply. Therefore, credit controls linked to reserve and portfolio requirements appeared as a viable tool for the central bank.<sup>9</sup> The selective credit controls worked well in affecting the overall lending, but were not effective for subsidising agriculture or industry. BdM tolerated partial compliance with sectoral lending requirements in return for insisting on a very high reserves ratio (Maxfield 1997). In addition, the bank ensured the market for national credit institutions (Shelton 1964).

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<sup>8</sup> This was in stark contrast to Brazil, the second largest and rapidly growing economy in Latin America, which resisted entering into regional trade agreements as its government was not convinced that this would be in line with Brazil's economic interests (Santos 2013).

<sup>9</sup> The banks complied in return for regulatory privileges: the commercial bank loan market remained unregulated and with high fee-inclusive interest rates; they had the freedom to own very profitable and unregulated investment banks; they continued lending to industries to which they were linked through management or ownership, thereby bypassing sectoral lending requirements.

## State investment bank

The *National Financiera* (or *Nafinsa*), established with mainly public capital in 1934, has been described as one of the most successful development banks (Cypher and Dietz 2009), having played a crucial role in enabling Mexico's industrialisation during the 1940s–70s period of 'stabilising development' (Moreno-Brid and Ros 2009).<sup>10</sup> It enjoyed a relatively autonomous position within the government and was relatively free from political interests, owing to close coordination with the Ministry of Finance and the BdM. There was considerable rotation of technical personnel between the three institutions and all three had more continuity of top officials than in other state agencies (Bennett and Sharpe 1980).

*Nafinsa* focused on the financing of industrialisation during 1940–47, and the financing of infrastructure and heavy industries in the period from 1947 up to the 1960s. It provided long-term capital to the private sector and formed partnership investments with the private sector and international firms. It played a key role in intermediating between international finance and domestic firms, both public and private<sup>11</sup>, as well as government (Stallings and Studart 2006; Shelton 1964).<sup>12</sup> *Nafinsa* also assisted BdM in handling public debt and in the promotion of capital markets (Shelton 1964), and acted as an exclusive agent for all long-term federal bonds and negotiated foreign credit — public or private — requiring government guarantee (Blair 1964).

Its close relations with the central bank<sup>13</sup> were a source of both strength and weakness. *Nafinsa* could easily borrow funds due to BdM's implicit support. BdM would either lend directly to *Nafinsa*; purchase some of its holdings of government securities; or require private and public financial institutions to purchase *Nafinsa*'s bonds as part of their liquidity requirements. But at the same time *Nafinsa* was used as a vehicle to support the central bank's monetary policy: the sales of *Nafinsa*'s securities were at times forced in order to absorb excessive liquidity or intervene in foreign markets to defend the currency (e.g. in 1938) rather than raise domestic capital for development financing (Blair 1964, 200–201, 209).

In summary, public financial agencies and institutions have played a significant role in extending financial credit to nascent industries in Mexico. *Nafinsa*, Mexico's state investment bank, played an important role in Mexico's industrialisation, particularly during the 1940s–1970s, when the state's control over the banking system followed strong developmental objectives. At the same time, Mexico's central bank actively used monetary policy instruments (particularly various types of reserve requirements) to support as well as to control the credit extended to manufacturing and agriculture by private financial institutions (Solis 1968; Maxfield 1997).

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<sup>10</sup> Despite many successes, *Nafinsa* and the overall state-led banking system was unable to effectively deal with the growing regional disparities and uneven development in Mexico (Marois 2007).

<sup>11</sup> It was regularly lending funds to private and public firms in the same industry (Blair 1964).

<sup>12</sup> In 1947, when *Nafinsa*'s range of activities increased, *Nafinsa* was tasked with approving all foreign borrowing from all public agencies and enterprises — this was the form of control over public debt-service capacities (Blair 1964, 221).

<sup>13</sup> The president and general manager of each institution was a member of the board of directors of the other (Blair 1964, 200).

## 3.2 Canada

### Overview

Canada experienced its highest productivity growth (2.51%) and growth in value-added (5.56%) during the 1960s. Indeed, it caught up with US productivity levels during this period while achieving a higher rate of output growth (Gu and Ho 2000, 172-173). The rates of growth of both GDP and productivity followed the pattern of public capital formation during this period (Seccareccia 1995), but then began to decline in the late 1960s and 1970s. According to Wylie (1995) the growth of labour productivity in Canadian goods production slowed from an average 5.29% per annum in 1947-72 to 1.87% in 1973-91, while public infrastructure capital accumulation per person-hour worked fell from 5.93% to 1.21% per annum. Canada was almost unique at the time in have a floating exchange rate for the majority of the 1951-75 period and few other capital controls, making its macroeconomic policy choices more amenable to comparison to modern economies.

### Main agencies, credit policy and coordination

Bank of Canada (BoC), created in 1935, played a key role in supporting the Canadian government's industrial policy up until the 1970s. This was achieved through direct or indirect financing of government spending, with the bank holding around a quarter of the government's debt over this period on average (Ryan-Collins 2017), alongside careful control of the government bond market to ensure cheap and plentiful public debt and also via the creation of a major state investment bank.

The low interest rates engineered by the bank's control of the bond market supported a huge expansion in production in the period 1945-1970, a good part financed by government capital spending, which reached around 20% of total fixed capital investment for most of the 1960s (Seccareccia 1995). Federal government capital expenditure funded highways, airports, bridges, schools, hospitals and other physical infrastructure.

As well as supporting SME financing, Bank of Canada ensured easy and cheap finance for government to support fiscal expansion and maintain a Keynesian policy of full employment. To achieve this, it used variable secondary reserve requirements, purchase and resale agreements, management of government deposit balances, interest rate agreements between the Bank of Canada and chartered banks, and quantitative credit guidance and moral suasion, both formal and informal (Neufeld 1958a: 75-80, McIvor 1958: 156-157, Chant and Acheson 1972). Moral suasion was defined by the bank as, 'A wide range of possible initiatives by the central bank designed to enlist the co-operation of commercial banks or of other financial organisations in pursuit of some objective of financial policy' (Bank of Canada 1962, 37).

When inflation did threaten Canada during the late 1940s, the bank used quantitative credit controls rather than raising interest rates as well as tax increases and spending cuts. More serious domestic inflationary pressures also arose in the late 1950s and led the bank to impose more restrictive monetary policies in earnest for the first time since the war, raising interest rates and selling securities into the market along with new liquidity reserve ratios. Such policies continued in

to the 1960s, leading eventually to a crisis with rising unemployment and the resignation of Governor James Coyne in 1961 (Coleman 1991: 721). This in turn led to a collapse of the currency against the US dollar and the decision to rejoin the Bretton Woods system in 1962. For the remainder of the 1960s, monetary policy was once again subservient to the full employment agenda of the government and the bank continued to maintain low interest rates on government debt through its controlling role in the bond market and credit controls.

## **The Industrial Development Bank of Canada**

BoC set up Industrial Development Bank of Canada (IDB) in 1944 as a subsidiary institution with a specific remit to support the small- and medium-sized enterprise (SME) sector in Canada. It was one of the first development banks fully publicly owned and became one of the largest and most successful (Business Development Bank of Canada 2014). There were concerns in the Canadian parliament that IDB would create a conflict of interest for the central bank, which was also charged with regulating the country's economy. However, the then deputy minister of finance did not see this as a concern, arguing that the link between the two banks would be beneficial to the central bank and, furthermore, 'The operations of the IDB will naturally have to dovetail into the country's monetary policy' and a corporate link between the two banks would make this easier (House of Commons 1944: 1441-3 in Clark 1985: 21). Notably, IDB was entirely funded via money creation by Bank of Canada during its 31-year existence.<sup>14</sup>

During this period, IDB authorised 65,000 loans totalling \$3 billion for 48,000 businesses (Clark 1985, 7); well over 90% were successful in establishing themselves and retiring their IDB loans and it was estimated that they employed close to 900,000 people (Clark 1985). Most of the bank's borrowers were small with an average loan size of \$47,000 and 48% of the loans authorised were for \$25,000 or less (*ibid.*). The volume of loans made by IDB stayed relatively stable throughout this period, even as economic conditions fluctuated (Clark 1985, 6). IDB's importance to the commercial sector grew throughout the 1950s and 1960s, and during its last ten years the bank provided the equivalent of 25% of total domestic bank lending to the private non-financial sector (Ryan-Collins 2015: 24).

In the early 1970s, the federal government recommended that IDB's link with Bank of Canada be severed and a separate Crown corporation, owned and funded directly by the federal government, be created.

In summary, the Canada case demonstrates the key role a central bank can play in supporting rapid economic development when it is well integrated into a wider government financial policy focused on the growth of key sectors. The bank used its money-creating powers to support the government and wider economy through direct financing through IDB via strong control over the bond market. More generally, the bank used its authority to cajole private banks into supporting

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<sup>14</sup> It was initially funded by the purchase of \$25 million equity stock by Bank of Canada. By the end of 1947, all \$25 million of stock had been taken down, leaving IDB with significant surplus funds, which were invested in government securities. By 1951 virtually all equity funds had been used up in IDB's loans. It made a number of further sales of bonds to Bank of Canada to maintain its capital at the same rate as Canadian government three-year bonds.

those sectors of the economy deemed of national importance, in particular small and medium-sized firms, enterprises and export sectors, via credit controls and moral suasion.

### 3.3 Norway

#### Overview

In Norway the most rapid industrialisation occurred after the Second World War and the amount of population working in industry surpassed that working in agriculture by 1950: 34% vs 27.3% respectively (Bjornheim 1974). Norway's value-added in production was at the level of semi-industrial countries (e.g. Argentina, Japan, Denmark) during the 1940s but intermediate goods accounted for a higher share, as compared to other countries, and industry accounted for 15% of GDP in 1950 (Balassa 1969, 346). The share of final manufacturing goods in total value-added rose from 37.1% (1949) to 48.4% (1966) and the volume of exported manufactured goods increased twelvefold between 1949 and 1966. The main export categories were chemicals, engineering products, followed by steel products, electrical machinery and textiles (ibid, 351, 355). Norway's productivity levels reached average European levels by the 1950s and despite natural resources dominating exports from 1970 (oil was first discovered in 1969) onwards, Norway developed a strong and large industrial base linked to natural resources sectors (Wicken 2016, 295-298). Productivity-inducing manufacturing was concentrated in those export-oriented sectors (Mjøset 2000).

Contrary to what is typically assumed in the literature, Norway (as well as Sweden) did not exercise active fiscal policies (in the Keynesian tradition) and in fact kept either a balanced budget or enjoyed a modest surplus during the post-Second World War period of growth (Knutsen 1997). Norway's Ministry of Finance was the main policy actor during the first two decades of post-war economic planning (Torvatn 1998). Instead, active credit allocation policies with the following key characteristics were used to support industry: very low, long-term interest rates (coordinated)<sup>15</sup> and stable prices; the supply of liquidity and credit by private banks was guided through targets; state banks enjoyed a stable flow of funds; and taxes and price controls were used to curtail excessive growth (Knutsen 1997; Moses 2000). Norway has relied more extensively on state-owned banks than the other Nordic countries. It operated fully administered, highly stable interest rates until the 1980s, in contrast to Sweden which more closely resembles the experience of Germany, where private credit institutions formed interest-rate cartels<sup>16</sup> (Tranøy 2000; Knutsen 1997).

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<sup>15</sup> The discount rate was 2.5% during 1946-1955 (Moses 2000, 89).

<sup>16</sup> For example, nominal interest rates never moved downwards between 1950 and 1983, but only went upwards, typically one step behind the inflation rate (Tranøy 2000, 47-48).

<sup>17</sup> *Norges Bank* did not develop the function of the 'lender of last resort' until very late (the turn of the 19th century), partially because until 1860 a large part of the privately owned bank's funds were tied-up in direct long-term lending. The basis for development of universal banking was also very weak (Knutsen 1997).



## Main agencies, credit policies and coordination

By the late 1980s *Norges Bank* was regarded as the least independent central bank in Western Europe, both in real and legal terms, and the Norwegian Ministry of Finance (MoF) had the reputation, which it maintains to this day, of being a 'super ministry'. Despite substantially stronger operational independence during the interwar period, especially in the 1920s, *Norges Bank* lost its position in 1945 when the post-Second World War monetary reforms were designed and the first institutions were set for state-led economic planning, including allocation of industrial credit<sup>18</sup> (e.g. Ecklund 2008; Lie 2019).

The importance of commercial banks notably reduced in the post-war period (from 43.7% of total credit in 1955 to 22.5% in 1980), while the role of state banks and mortgage banks increased (from 38% of total credit in 1955 to 58% in 1980). In addition, until the 1980s<sup>19</sup> the government exercised substantial control over corporate bond issuance and priority was given to the allocation of quotas for mortgage banks; state banks expanded activities (6.6% of total credit in 1955 to 18.5% in 1980) (Knutsen 1997, 117-118).

In terms of enforcement and coordination mechanisms, the government relied on a mix of informal (negotiations, recommendations) and formal (legal) arrangements, although increasing formalisation in the form of laws can be observed throughout the 1970s (Moses 2000). A Co-operation Committee was established in 1951, representing a more so-called 'corporatist' mode of credit guidance policies. Its members included *Norges Bank*, the MoF, the Bank Inspectorate, commercial banks and life insurance companies. The committee produced a few pieces of legislation for credit and monetary policies, including lending guidelines, throughout its lifetime which lasted until the early 1960s. In principle, the banks were to comply on a voluntary basis, although in practice compliance with 'recommendations' meant that no stricter or more extensive regulations would be introduced and a system of binding annual agreements was used during 1951-1955 (Lie 1995).<sup>20</sup> Since 1952 the government (MoF) was able to increase reserve requirements to be held at *Norges Bank* by private banks, including deposits in interest-free accounts, which allowed it to provide more resources for funding state banks (via the Treasury) (Lie 1995 in Moses 2000).

The Co-operation Committee produced a milestone agreement in 1955: quantitative restrictions on commercial and savings banks lending, and on purchase of state and state-guaranteed bonds, were introduced.<sup>21</sup> Banks agreed to hold their credit levels at virtually the same levels in 1955,

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<sup>18</sup> Lie (2019) refers to the discussion over monetary reform following the Second World War between the government in exile, including pre-war *Norges Bank* officials, and the actual management of *Norges Bank* in Norway during the war. *Norges Bank* did not partake in the reform discussion and neither was it active in negotiating its own position within the governance structures. In addition, local discourse, including among academics such as Ragnar Frisch (the founder of econometrics), was strongly in favour of interventionist policies and Frisch's students would later work in various government agencies, including MoF.

<sup>19</sup> Legislation was passed in 1953 introducing controls over the bond market entry: the entry, interest rates and other conditions of floating bonds became subject to the government's approval, including the actual investment plan of the borrower (Knutsen 1997).

<sup>20</sup> Annual agreements included the rules for lending policies and the amount of government bonds banks had to purchase.

<sup>21</sup> The bond market was regulated in quantitative and qualitative terms: emission of new bonds was based on quota-ranking system which prioritised power and shipbuilding sectors; there were limits on bonds issued by private firms and

1956 and 1957, and agreed to purchase government bonds based on fixed criteria. MoF agreed not to lobby for a new law that would challenge the authority of the committee, thereby allowing the responsibility of credit controls to move to *Norges Bank* since the committee operated under the central bank (Moses 2000, 92). Work on more formal credit supply control started in 1960 with the establishment of the Monetary and Credit Policy Committee (its report was similar to the UK's Radcliffe Report, but included much more specific policy recommendations) (Moses 2000, 118). A conflict arose in 1961 when banks undermined *Norges Bank's* request to increase the reserves requirements by lending their foreign exchange (Lie 1995 in Moses 2000), which led to new legislation being passed in 1965 (discussed below) and the re-empowerment of the MoF.

With industrial policies becoming more targeted and sector-based in the 1960s, and liberalisation of trade (carried out very gradually during the 1950s), Norway introduced more extensive credit allocation controls with the decision-making now concentrated in the hands of the MoF. The Law on Money and Credit (1965) stipulated liquidity requirements for credit institutions. *Norges Bank* had to authorise all foreign exchange transactions through the license, but bonds and long-term borrowing from foreign capital markets now had to be licensed by the MoF.<sup>22</sup> Since 1965 the government's credit plans and expectations of future credit demand were published as part of the national budget. The Cooperation Council was dissolved by the founding private financial institutions and mandatory purchase of state bonds continued to play an important role in channelling funds to state banks. Lending was also controlled indirectly through liquidity levels (requirements on primary and secondary reserves) and greater control over the emission of bonds was introduced (emissions based on quotas and sector-based priorities) (Moses 2000).

To summarise, until the early 1980s Norway relied on its network of public and quasi-public organisations, which operated within the framework set by *Norges Bank*, the MoF and the Ministry of Industry and Ministry of Trade (Knutsen 1997). Norway designed a more 'corporatist' and coordinated mode of financial policy decision-making<sup>23</sup> with a number of *ad hoc* committees in operation to decide on monetary and credit policies.<sup>24</sup> The central bank played a modest role in directing industrial credit, but it fulfilled important analytical and administrative functions: performing major analytical tasks for the Regional Development Fund, administration of the fisheries loan scheme and acting as the branch office for the Public Fisheries Bank (*Norges Bank*, undated). Overall, the main success was the ability to rebuild the economy, despite foreign exchange shortages and the dependence on foreign inputs, by utilising extensive credit controls

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municipalities. In the meantime, state banks could increase their activities on the bond market without affecting the interest rate (Moses 2000, 92).

<sup>22</sup> A Currency Regulations Council was established in the 1950s and was composed along the same lines as the Cooperation Committee.

<sup>23</sup> Nationalisation of the banking system was on the political agenda during the 1940s, but the dominant Labour Party strongly advocated for a corporatist solution (Knutsen 1997).

<sup>24</sup> At the same time, many committees were not strictly corporatist: for example, a separate Agency for Industrial Finance was set up in 1959 to attract foreign investment and this played an important role in the rapid development of the Norwegian aluminium industry in the 1960s. This should be viewed in the context of extensive external controls Norway believed were crucial for ensuring full employment (Bjerve 1989), combined with the important role European credit played during 1951-1955 (as Marshal Aid funds were ending) and a deliberate strategy to increase foreign capital in the late 1950s (10% of total credit supply in the early 1950s to 50% in the late 1950s) (Frøland 2004). Further, the Regional Development Fund and the Regional Fund (in charge of new growth areas, such as electronics) also represented a more direct allocation of industrial finance in the 1960s (Knutsen 1997).

and subsidies, and the establishment of a highly effective corporatist regime (Knutson 1997, 95-96).

## 3.4 Japan

### Overview

Japan was the first non-European or North American economy to achieve sustained industrialisation in the post-Second World War period with a GDP growth rate of 6.2% during 1960-1990. Manufacturing grew from 27% in 1955 to 35% in 1970, measured in value-added, and from 17% (1955) to 26% (1970) in terms of employment (Kohama 2007, 8). The composition of the industrial base also changed: until 1950 textiles represented over 20% of manufacturing (in income terms) and more than 40% of manufacturing revenues came from light industries. By 2002 these figures fell to 1% for textiles and 16% for light industries (Kohama 2008, 9)

Japan's 'economic miracle' is typically described through the prism of industrial planning bureaucracy and particularly the Ministry of International Trade and Industry (MITI) (Johnson 1982). Some scholars argue that economic planning and finance were two distinct domains and policy networks that rarely intersected in post-Second World War Japan (Mabuchi 1997; van Wolferen 1989). Others note that even loose coordination of industrial policies in Japan still went 'beyond what most other industrial states have managed to achieve' (Okimoto 1989, 20). The literature on East Asian developmental states emphasises vertical and horizontal centralisation of bureaucracy as one of the key ingredients of economic success (Wade 1990, 2018; Evans 1995).

### Main agencies, credit policies and coordination

MITI closely coordinated its industrial promotion plans with the Ministry of Finance, especially the Budget Bureau, and both ministries used 'administrative guidance' to nudge industrial firms and credit institutions or banks towards selected economic activities. The roles of MITI and the Ministry of Finance (MoF) can be at times described as complementary: during the 1950s-60s, MITI promoted cartelisation among large industrial firms to avoid excessive price competition,<sup>25</sup> while credit guidance policies enabled an 'investment race' between these firms towards larger exports. That is, oligopolistic formations were offset by productivity growth and rigorous competition in international markets (Yamamura 1986).

Among key financial agencies, an explicit rivalry existed between the MoF and Bank of Japan (BoJ). War efforts brought consolidation of credit allocation power to BoJ with the Bank of Japan Law 1942, although during the immediate post-war years the MoF became the key 'super ministry'. The MoF reformulated the wartime loan classification system in 1947 and limits were set on the amount of loans for each financial institution. Towards the 1960s, however, MITI-run Industrial Finance Committee and policy planning departments began to interact directly with the

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<sup>25</sup> Werner (2003) also mentions that cartels and industry associations served the purpose of bureaucratic 'guidance'.

BoJ Banking Bureau regarding which economic sectors should receive funds. This meant that so-called 'window guidance' — the Japanese term for credit guidance — was relatively free from MoF interference. MoF was explicitly consulted on the official discount rate, but window guidance remained under the sole supervision of BoJ — and was operated in a covert fashion, until it was abruptly discontinued in 1991 (Werner 2003).

Indeed, in stark contrast to the prevailing view that BoJ was subordinated to the Ministry of Finance, Werner (2002, 2003) provides extensive evidence that window guidance exercised by the BoJ at its own discretion played a significant, if not decisive, role in credit allocation until the early 1990s. Window guidance involved the BoJ establishing an overall nominal GDP growth target for the economy and then providing banks with an aligned quantitative credit growth target and quotas for lending against specific sectors. These were effectively binding, because the BoJ's power as the central bank allowed it to impose sanctions and penalties, such as cutting rediscount quotas, applying unfavorable conditions to its transactions with banks or reducing the next window guidance quotas (Werner 2002: 18; Patrick 1962).<sup>26</sup> In addition, in the post-war era large city banks borrowed heavily from the central bank, making them highly dependent on the BoJ.

The effectiveness of Japanese window guidance has been debated, with some scholars attributing more discretionary powers to the MoF and MoF-BoJ joint decisions on the discount rate, while Werner (2002) documents how window guidance, with its very direct and almost immediate effects on credit-creation,<sup>27</sup> has been the most effective and most important monetary policy tool used by BoJ, including throughout the 1980s when it became more pervasive. In retrospect, such direct and covert intervention was effective when interest rates were low during the 1950s-60s (to curtail the quantity of credit), but Werner (2002) further argues that excessive growth quotas were imposed on banks during the 1980s, which directly contributed a real estate bubble. Because the actual procedures of the window guidance were kept in secret, including from the MoF, this raises questions regarding BoJ's accountability and clearly speaks of a high degree of its *de facto* independence.<sup>28</sup> One reason for the secrecy may have been that internationally such credit policies were becoming unfashionable and international organisations such as the IMF, OECD and World Bank were pressing countries to abolish such policies (Bezemer et al 2021).

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<sup>26</sup> BoJ had far-reaching powers to vary the quotas by sector, by bank and by company (Werner 2002, 2003; both Calder (1993) and Mabuchi (1997) also refer to the window guidance, but debate its effectiveness). Building on the experience of strict credit controls that helped fight hyperinflation in Germany in the 1920s, developed by Reichsbank's governor Schacht, BoJ used these so-called 'qualitative credit controls'<sup>26</sup> from 1942 until July 1991 (Werner 2002; also Calder 1993).

<sup>27</sup> Banks adhered to the quotas: the banks always went to the maximum of the ceilings and some types of banks (city banks) had to comply not only with the quarterly, but also quarter-average controls (which remained secret) since a decreased quota for under-performing lenders would mean a competitive disadvantage to the banks with higher quotas (Werner 2002).

<sup>28</sup> *De jure*, BoJ was fully entrusted with monetary policy only in 1998.

## Japan Development Bank

Japan Development Bank (JDB), established in 1951, through which investment funds from the national Fiscal Investment and Loan Programme (FILP)<sup>29</sup> were channelled to prioritised investment projects, played a significant role within the overall institutional setup of the financing of industrialisation in Japan. JDB's operations were complemented by the three privately owned long-term credit banks.<sup>30 31</sup> JDB was never the sole vehicle for covering the risks of private financial institutions and always acted as a co-lender with private banks. Since JDB was managing public funds, it was not in the list of private deposit-taking credit institutions<sup>32</sup> and therefore was not subject to BoJ supervision, including any window guidance. It was owned by the MoF, operated under its supervision (although its principles were stipulated in the Japan Development Bank Law) and lending rates were determined in close consultation with the MoF to ensure it was coordinated with the official discount rate (Development Bank of Japan and Japan Economic Research Institute 1999).

JDB was allowed to obtain additional funds through external issuance of bonds, guaranteed by the government. JDB did not have a predetermined level of reserve requirements either, and allocation of funds between policy-based institutions involved budgetary considerations and hence was under the jurisdiction of MoF. The interest rates of JDB loans were harmonised with the market rate of government bonds as a benchmark. In terms of interacting with the other ministries, JDB also had leeway in implementing approved investment/funding programmes, while making its own judgment about which projects to select, how much to lend and the degree of co-lending from other financial institutions (Development Bank of Japan and Japan Economic Research Institute 1999).<sup>33</sup>

In summary, Japan's decades of extraordinary growth and industrial development from the 1950s to the 1980s — a period that saw it become a globally leading exporter of high-value-added goods — was a period of highly interventionist and largely coordinated financial policy. Both the MoF and BoJ ensured that national industrial policy objectives were carried through in the financing of industry, via coordination with MITI, though the establishment of one of the most detailed and comprehensive credit guidance regimes in history. This was complemented by a powerful public development bank with close links to, but relative autonomy from, the MoF.

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<sup>29</sup> Considered as the 'second budget', FILP funds were predominantly 'spent' by policy-based financial institutions: some 52% of total FILP budget was allocated in 2000 (Mori 2000, 60).

<sup>30</sup> Industrial Bank of Japan, Long-term Credit Bank of Japan, Nippon Credit Bank — all put in place via the Long-Term Credit Bank Law in 1952.

<sup>31</sup> Long-term credit banks were allowed to issue debentures that were held by city banks, thereby allowing long-term credit banks to earn higher profits than deposit rates, which were regulated. Further, large city banks were borrowing from smaller regional banks, thereby contributing to the distribution of profits from high-growth urban areas to regions and rural areas (Takahashi 2012).

<sup>32</sup> Unlike its predecessor, Reconstruction Finance Bank, which contributed to inflationary pressures right after the Second World War by supplying colossal sums to priority sectors while being the only provider of funding for capital investments during 1947-1949. JDB's funds were created through bonds underwritten by BoJ (Mori 2000; also Werner 2003).

<sup>33</sup> In contrast, government corporations were subject to project and funding approval from the relevant ministry each quarter, after respective funding programmes were approved between the ministries and the MoF.

## 3.5 South Korea

### Overview

Korea experienced one of the most spectacular economic transformations of the 20th century. Between the early 1960s and the 1990s, in just three decades, it went from being one of the poorest nations in the world to a developed and financially independent economy (Song 1990; Harvie and Lee 2003). Between 1962 and 1989, per capita income increased from US\$87 to US\$5,199; national output expanded from US\$2.3 billion to US\$220.7 billion; and exports increased from US\$55 million to US\$61.4 billion (Harvie and Lee 2003). This transformation was achieved through export-led industrialisation, the rapid development of large-scale industrial conglomerates, and economies of scale and technology to achieve international competitiveness. Directed finance and credit played a central role in this process (Smith 2000; Amsden 1989; Calder 1993). Indeed, for most of the period, Korean banks were nationalised and focused primarily on policy-oriented finance.

### Main agencies, credit policies and coordination

Korea's post-war finance regime should be viewed in the context of a growth-first economic strategy (with little distributional considerations). Decision-making power was concentrated in growth-oriented state agencies, the Presidential Office, the Economic Planning Board (EPB) and the Ministry of Finance (MoF). The MoF acted as the 'hands' of the EPB, which designed plans under approval and in line with the long-term Presidential Office's vision. The MoF was granted unlimited powers in setting interest rates, foreign exchange policy and capital controls (Thurbon 2016, 57-58).

The MoF was staffed with Korean-educated officials well into the 1990s (the exception being politically appointed top officials), who looked to Japan for inspiration relating to industrial policy, including approaches to finance.<sup>34</sup> The Korean central bank, Bank of Korea (BoK), was subordinated to the Ministry of Finance through reversal of the Bank of Korea Law in 1962<sup>35</sup> and the amendments of 1962 significantly reduced BoK's discretion by bringing control over monetary and credit policies back to the MoF (Thurbon 2016). Therefore, industrial policy and credit allocation decisions were more centralised in Korea than in Japan. A nationalised banking system, little consideration for inflationary pressures and a set of long-term policy-oriented financial institutions with the large state-owned Korea Development Bank at the top meant that Korea represented a 'repressed finance regime' *par excellence*.<sup>36</sup>

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<sup>34</sup> In contrast to this, in the 1970s the Economic Planning Board experienced an influx of US-educated staff (Amsden and Euh 1993).

<sup>35</sup> Under pressure from the US Fed experts, the Bank of Korea Law 1950 granted the newly established central bank operational independence in ensuring price stability, and extensive control over the currency, credit and foreign exchange.

<sup>36</sup> This should be also seen through a comparative lens with Taiwan, where a long-standing consensus among financial elite bureaucrats in the MoF and central bank favoured macroeconomic stability and a gradual approach to liberalisation. That is, the central bank of China, Taiwan's central bank, followed the goal of price stability while playing an important development finance function, recycling Taiwan's foreign exchange reserves into projects in prioritised industries. The debt-driven strategy so prevalent in Korea was pursued with much more caution in Taiwan: tax breaks were investment incentives and there was less tolerance of high debt-to-equity ratios (Thurbon 2016, 60; also Thurbon 2007).

BoK financing was used directly and extensively for the financing of industrialisation through nationalised commercial banks: half of all policy loans by commercial banks were refinanced by BoK. Therefore, the ratio of policy-oriented financing was high — at around 33% — among commercial banks, even in 1990s. This was a situation of over-lending and high inflation (it averaged 12.2% during 1961-1991). Indeed, inflation rates in Korea were the highest in the region, next only to Indonesia (Japan Bank of Japan and Japan Economic Research Institute 1999, 97). Refinancing by BoK further expanded when Korea embarked on developing heavy industries in the 1970s and export refinancing at preferential interest rates continued well through the 1980s. Nowadays, in the context of revived ‘financial activism’ (Thurbon 2016), BoK directly supports the financing of SMEs through a credit guidance system (Chang 2015). Under the credit ceiling system, BoK allocates funds to 17 commercial banks based on quarterly aggregate credit targets. Under a minimum loan ratio system, BoK stipulates SME lending ratios such as 45% for commercial banks, 60% for provincial banks and 35% for domestic branches of foreign banks. In addition, below-market interest rates are applied by BoK to its aggregate credit ceiling loans. Penalties in the form of revised aggregate credit ceilings are applied to banks that fail to achieve SME lending ratios (Chang 2015 259).

## Korea Development Bank

Korea Development Bank (KDB) was established in 1954 and stands at the apex of long-term policy loans. It was designed with the Japan Development Bank Law as a template, but its sources of funds significantly differed. While JDB was financed through non-inflationary stable public funds (that had to be repaid) channelled through the Fiscal Investment and Loan Programme (public savings), KDB had to soon start borrowing from foreign capital markets after fiscal transfers in the form of concessionary government funds ended in the 1970s. KDB bonds were mandated for purchase by commercial banks. KDB enjoyed sound economic performance and developed significant capacities in technology appraisal and economic analysis that were used to guide industrial policy. It represents a strategic type of state investment banking, which has ‘financial power’ and the relative autonomy to make investment decisions and assume related risks (Mikheeva 2019). Classified as a non-banking institution, KDB was not subject to the central bank’s supervision, but reported to the MoF and enjoyed far less autonomy than, for example, its Japanese counterpart JDB did.<sup>37</sup> It did, however, hold deposits entrusted by BoK, but these were eventually reimbursed in 1997 (Japan Bank of Japan and Japan Economic Research Institute 1999, 96).

Privatisation of Korea’s banks commenced in 1982 and following the conditionality of IMF assistance in the late 1990s, the policy-oriented refinancing activity of BoK was substantially reduced and the operational independence of the central bank strengthened, while the operations of KDB were left intact. Although by the late 1990s KDB ventured into deposit-taking and commercial banking operations, it continued to provide the lion’s share of funding in the form of

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<sup>37</sup> Following IMF-induced financial reforms after the Asian Financial Crisis, KDB became subject to supervision by the Financial Supervision Committee in 1999.

loans to industry, which stood at a high of 70% in the 1990s (Japan Bank of Japan and Japan Economic Research Institute 1999).

In summary, Korea's post-war rapid industrialisation was based on policy loans channelled through the nationalised banking system and long-term industrial credit provided by specialised financial institutions, among which KDB was the largest and most systemically important. BoK played a key supporting role by refinancing policy loans to state-owned commercial banks and was largely subordinated to the MoF. This is in contrast to Japan, where despite an equally powerful MoF, the BoJ maintained a stronger discretion in credit guidance policies (window guidance).

## 3.6 China

### Overview

China's remarkable economic growth since the 1980s is well documented. Indeed, the country has lifted more people out of poverty than any other nation in history — 800 million according to the World Bank (Business Standard 2017). This resulted in the transformation of the country from a predominantly agricultural to industrial economy in the space of just 30 years. Despite several market-oriented reforms since the 1990s, its financial system remains highly directed towards industrial priorities and is dominated — more than in any other major economy — by publicly owned banks, in particular China Development Bank (CDB). The central bank also plays a key role in directing credit and the financing of the three existing 'policy banks'<sup>38</sup>, including requiring commercial banks to purchase bonds in CDB.

### Main agencies, credit policies and coordination

China's central bank, the People's Bank of China (PBoC), has been relying on direct credit control quotas since 1984 when the monetary policy framework was built (Xie 2004). It was modelled on the experience of Japanese window guidance policy (Allen et al 2017). With the adoption of indirect monetary policy tools, its importance in the policy mix reduced, but intensified in the early 2000s, following an expansionary economic cycle (ibid). The PBoC reports quarterly (in its monetary policy reports) on credit guidance and credit policies for structural guidance. These policies are used in order to:

'...promote optimization of the economic structure and upgrading of the industrial structure, transformation of the energy mix, financial inclusiveness, and the people's livelihood, and to guide financial resources to key fields and important areas for economic and social development and to weak sectors so as to effectively meet the financing needs of the real economy'.

(People's Bank of China 2018, 29)

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<sup>38</sup> Owned by the State Council, there are currently three policy banks: Chinese Development Bank, Agricultural Development Bank of China and China Export Import Bank.



Other what were until recently called 'non-conventional monetary policy tools' were launched in 2013-2014 (ibid). Among these a 'pledged supplementary lending' facility (PSL) was introduced in 2014, through which long-term funds are lent directly to policy-oriented financial institutions such as CDB, Export-Import Bank and Agriculture Development Bank of China. In this way the central bank attempts to control medium-term lending rates while helping maintain liquidity in specific sectors. The PSL also allows policy banks to borrow from the central bank against high-quality collaterals (corporate bonds and high-quality assets) for three to five years and targets 'projects with specific purpose' (Fang et al 2020; Macfarlane and Mazzucato 2018).

## **China Development Bank**

China Development Bank (CDB) has been credited with a substantial contribution to China's economic growth at home and expansion abroad (Sanderson and Forsythe 2013). Established in 1994, CDB was granted a ministry status, which is reflected in its design, organisational structure and coordination with other government agencies. It operates under the State Council and its Board of Directors includes various government agencies. The MoF contributed the initial paid-in capital. CDB was the first financial institution in China to have a credit committee, established to emphasise the importance of credit risk control, and credit analysis and risk management skills were perceived by the CDB governor as essential for maintaining CDB's autonomy (Development Bank of Japan and Japan Economic Research Institute 1999). In the words of one of CDB's governors: 'CDB serves as a bridge linking the government with market, and as such can fulfil its commitment with the support from both the government and market' and 'with the help of government credit, it is possible to establish a credit structure covering local governments, industries, big enterprises and the capital market' (Yuan 2001, 21, 24).

In the 1990s interest rates for CDB loans were set by deducting a preferential rate from the standard rate established in the central bank's guidelines. Since 1995 a standard market interest rate is applied to new projects with government (MoF) subsidies provided on a case-by-case basis (mostly large-scale projects). Interest rate subsidies are not provided to CDB, but rather directly to the project, amounting to 1-3% in interest rate terms. In addition, CDB can negotiate with the MoF to gain approval for low-interest financing (Development Bank of Japan and Japan Economic Research Institute 1999). CDB finances projects based on the government's five-year plans, and projects are classified at national (State Council, State Planning Commission) and regional levels. The amount of capital to be taken each year, interest rate subsidies and settlement of accounts, including provisions for bad debts, are discussed with the MoF.

CDB acquired an extensive network of branch offices in 1998, which also helped centralise credit control: previously the PBoC had operated too closely with regional governments, which at times resulted in generous credit (Development Bank of Japan and Japan Economic Research Institute 1999). CDB was instrumental in allowing regional governments setting up state-owned companies as a vehicle to finance infrastructure projects through off-balance sheet borrowings from CDB (Ru 2018), thereby 'turning their institutional advantages into a credit advantage' (Yuan 2001, 21).

After becoming a joint stock corporation in 2008 and obtaining the status of a Development Finance Institution in 2015, CDB is regulated by the PBoC. Its primary source of funds remains

bonds issued on the interbank bond market, and purchased by commercial banks and other financial intermediaries (with 0% risk weighting).<sup>39</sup> Although CDB is not listed as a credit-creating institution, much of debt is effectively monetarily financed rather than coming from the taxpayer via commercial bank purchases of its bonds.

To summarise, the PBoC has been actively using direct credit controls since 1984 and window guidance continues to play an important role in economic policy. China's central bank has been also instrumental in financing CDB through bond purchases; first through direct allocation among financial institutions and later through its own purchases of CDB bonds. Currently, green credit and refinancing policies conducted by the PBoC represent an additional type of direct credit guidance policies pursued by China's central bank in close coordination with CDB and other banks (Dikau and Volz 2021).

Table 1 presents a comparative summary of the six cases, grouping them into three categories: the roles of dedicated financial agencies and institutions; industrial credit policies; and coordinative mechanisms and institutions between key agencies.

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<sup>39</sup> CDB bond issue is subject to approval by the State Council and the PBoC. Initially, mandatory quotas were set by the PBoC each year and subscriptions were to be purchased by postal savings organisations, commercial banks, urban cooperative banks and rural credit cooperatives. CDB bonds therefore constitute a key asset class for the entire Chinese financial system. Since 1998 CDB bonds have been sold through competitive bidding and hence became more liquid, which facilitated the PBoC's open market operations. In 1996 CDB started issuing foreign bonds.

Table 1. The governance of finance: institutions, policies and coordination

Country (time period)	Dedicated industrial financing institution (role, funding structure, institutional set-up)	Private sector credit and bond market policies	Coordination, including potential conflicting objectives
Mexico (1940s-1970s)	<ul style="list-style-type: none"> <li>▪ <i>Nafinsa</i> performed a mix of functions: from industrial lending and taking stakes in industrial firms to being the main public institution for raising funds abroad and managing public debt.</li> <li>▪ Enjoyed relative autonomy within the government and provided technical training to other government agencies.</li> <li>▪ Raised funds from debentures purchased by BdM and other banks, and from foreign loans.</li> <li>▪ Overall development strategy built over trade liberalisation.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Quantitative credit controls with weak enforcement: <i>cajones</i> differed according to the types of borrowers.</li> <li>▪ Inflation is the main reason for credit controls.</li> <li>▪ Credit controls combined with differential discount rates and reserve requirements.</li> <li>▪ BdM could enforce banks to hold securities of certain corporations or financial institutions (<i>Nafinsa</i>).</li> </ul>	<ul style="list-style-type: none"> <li>▪ Hierarchical coordination between BdM/MoF and <i>Nafinsa</i>, but with <i>Nafinsa</i> having elements of technical operational autonomy.</li> <li>▪ Different views on credit controls: price stability (BdM, MoF) vs sectoral and geographical development (Ministry of Agriculture, Ministry of Patrimony).</li> <li>▪ Continuity of personnel and high technical autonomy between financial agencies: MoF, BdM, <i>Nafinsa</i>.</li> </ul>
Canada (1940s-1970s)	<ul style="list-style-type: none"> <li>▪ Industrial Development Bank of Canada (IDB) set up and fully financed by the central bank specifically to support the SME sector.</li> </ul>	<ul style="list-style-type: none"> <li>▪ IDB was an agency of BoC.</li> <li>▪ Quantitative and qualitative credit controls and more suasion.</li> <li>▪ Direct and indirect financing of government debt, including controlling the government bond market and forcing commercial banks to hold debt at below market rates.</li> </ul>	<ul style="list-style-type: none"> <li>▪ IDB was an agency of the central bank.</li> <li>▪ Close coordination between the ministry of finance and the central bank on industrial policy.</li> <li>▪ Late 1950s conflict between the MoF and BoC about how to deal with high inflation eventually led to the resignation of the central bank governor who wished to raise interest rates beyond a level acceptable to the MoF.</li> </ul>

Country (time period)	Dedicated industrial financing institution (role, funding structure, institutional set-up)	Private sector credit and bond market policies	Coordination, including potential conflicting objectives
Norway (1940s-1980s)	<ul style="list-style-type: none"> <li>State-owned banks performed the developmental function of industrial credit provision (Industrial Bank was founded in 1936 too though) and regional development.</li> <li>Stable flow of funds to state banks through depositing with Norges Bank and/or securities purchases.</li> <li>Active credit policies (and not fiscal policies) were the main element in the growth strategy.</li> <li>Strong external controls.</li> </ul>	<ul style="list-style-type: none"> <li><i>Norges Bank</i> implemented credit allocation policies with strong enforcement and good compliance (until the mid-1960s).</li> <li>Controls over bond issue (screening of business plans) until it passed to MoF.</li> </ul>	<ul style="list-style-type: none"> <li>Hierarchical coordination between MoF and <i>Norges Bank</i> with some notable exceptions (Cooperation Committee in 1950s).</li> <li>Corporatist coordination (through committees) with commercial banks and within government.</li> </ul>
Japan (1940s-1980s)	<ul style="list-style-type: none"> <li>JDB raised funds through MoF FILP programme, a stable flow of public savings funds ('a second budget'). Could also raise funds from capital markets.</li> <li>In addition, three privately owned long-term credit banks could also issue debentures.</li> <li>Extensive external financial controls until the 1970s.</li> </ul>	<ul style="list-style-type: none"> <li>BoJ operated detailed 'window guidance' (quantitative and qualitative controls) with strong enforcement and high compliance from the banks.</li> <li>BoJ set the official discount rate in consultation with the MoF.</li> </ul>	<ul style="list-style-type: none"> <li>Networked coordination between the MoF and MITI, and between MITI and BoJ.</li> <li>Jurisdictional conflicts between MITI and MoF, but continuity was ensured by LDP party (in power 1960s-90s)</li> <li>BoJ <i>de facto</i> operating window guidance independently from the MoF.</li> <li>JDB operating under the MoF, but enjoys operational autonomy, and was not subject to BoJ supervision and window guidance controls.</li> </ul>

Country (time period)	Dedicated industrial financing institution (role, funding structure, institutional set-up)	Private sector credit and bond market policies	Coordination, including potential conflicting objectives
Korea (1950s-1980s)	<ul style="list-style-type: none"> <li>▪ KDB largely raised funds from capital markets, including from abroad. Initial capital came from the fiscal budget. Not supervised by BoK, but by financial supervisory commission (only since 1997).</li> <li>▪ KDB staff provided technical training to government bureaucrats (e.g. technology evaluation) and industrial credit policy inputs to the ministries.</li> <li>▪ Nationalised commercial banks performed policy-oriented industrial lending.</li> <li>▪ High indebtedness of industrial firms, high inflation (growth-first strategy) and extensive external controls until the 1980s.</li> </ul>	<ul style="list-style-type: none"> <li>▪ BoK was rediscounting half the lending provided by nationalised commercial banks to ensure support of priority sectors.</li> <li>▪ BoK also rediscounted a large share of commercial banks' loans to the industrial sectors.</li> <li>▪ BoK was at times forced by the MoF to purchase government securities.</li> </ul>	<ul style="list-style-type: none"> <li>▪ BoK subordinated to the MoF.</li> <li>▪ Strong vertical coordination of economic planning with the Presidential Office with unlimited powers.</li> <li>▪ Stronger vertical coordination of policy-oriented financial policies with the MoF acting as the 'super ministry'.</li> <li>▪ The MoF was staffed with Korea-educated officers vs abroad-educated in the Economic Planning Board (since the 1970s).</li> <li>▪ KDB operates under the MoF but enjoys some operational autonomy.</li> </ul>
China (1980s-present)	<ul style="list-style-type: none"> <li>▪ CDB has a ministry status, is very centrally positioned and extends funding to private companies, state-owned enterprises and local/regional governments.</li> <li>▪ CDB raises funds from capital markets, both domestic and foreign, but is also</li> </ul>	<ul style="list-style-type: none"> <li>▪ PBoC has maintained quantitative credit controls since 1984.</li> <li>▪ Window guidance was modelled after Japan, reported quarterly.</li> <li>▪ Runs lending facilities whereby funds are channelled through</li> </ul>	<ul style="list-style-type: none"> <li>▪ Networked coordination between PBoC and MoF, with PBoC maintaining quantitative credit controls.</li> <li>▪ Hierarchical coordination between PBoC and CDB (bond issue, supervision, on-lending).</li> <li>▪ Hierarchical coordination between CDB and the State Council/State Planning Commission</li> </ul>

Country (time period)	Dedicated industrial financing institution (role, funding structure, institutional set-up)	Private sector credit and bond market policies	Coordination, including potential conflicting objectives
China (1980s- present)	<p>financed by national and commercial banks, and enjoys sovereign credit rating</p> <ul style="list-style-type: none"> <li>▪ Supervised by the PBoC.</li> </ul>	development banks.	<p>(projects).</p> <ul style="list-style-type: none"> <li>▪ CDB coordinates with the MoF on subsidies for mega-projects (infrastructure) and soft loans.</li> </ul>

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## 4. Discussion

The case studies described in section 3 demonstrate the potential and challenges of coordinating and governing finance to support industrial objectives and structural transformation. To what extent can we draw lessons from these cases in helping to address the financing of the net-zero carbon transition given the limitations of the current market-based approach outlined in section 2?

Firstly, as discussed in section 2.2, the net-zero carbon transition requires long-term, patient, risk-welcoming capital to fill the green finance gap (Mazzucato and Semeniuk 2018). Modern private and market-based finance has not welcomed such risk. In contrast, all our case studies established major public finance institutions to help provide 'patient' finance — at an appropriate price — to support industrial development. These institutions coordinated closely with ministries of finance and central banks, in some cases being financed directly or even owned by them.

In terms of sources of funds, state investment banks obtained funds from non-tax revenues with the exception of the very early years of operations and/or financing lines initiated by the ministries of finance (e.g. on certain soft-loan schemes). The majority of activities, however, were (are) financed from various non-tax channels: either government savings instruments and postal savings, or central bank loans and funds raised on domestic and foreign markets, including foreign multilateral institutions, or from bond purchases by central banks and domestic financial institutions. Indeed, where SIB bonds were purchased by deposit-taking commercial banks or central banks, state investment banks can be understood to be channelling newly created money into industrial development. For the most part, this is not the case if banks are only channelling state-sponsored grants or borrowing on capital markets as many European promotional banks do today (see Mikheeva and Juuse 2021). From the regulatory perspective, most SIBs were regulated as non-financial institutions during the time periods discussed in this paper, but many became subject to supervision by central banks and/or regulatory authorities during the 1990s-2000s. According to the World Bank survey, the majority of development banks (survey respondents) are supervised by their respective central banks or supervisory authorities and those that are established as 'companies' tend to be regulated as commercial banks (World Bank 2018).

Secondly, a problem with the market-based approach to green finance is the problem of fundamental uncertainty associated with climate change, both in terms of long-term physical risks and shorter-term transitional risks (Chenet et al 2021). This limits price discovery as it becomes impossible to assign probability to different future outcomes. In our case studies, financial policy makers addressed the problem of uncertainty in part by the creation of the public financial institutions already mentioned, but also via implementing multiple credit policies, involving the directing of credit towards strategic industrial priority sectors and the suppression of credit to less desirable sectors. Usually, central banks lead on the implementation of these policies. These interventions ranged from corporatist negotiation

arrangements in the Nordic countries, to credit controls in the UK and France, to the 'lender of last resort' role and targeted refinancing schemes in Korea, Mexico and Brazil, to covert and extraordinary detailed window guidance policy in Japan. In the modern context, China's central bank has been pursuing credit guidance policies in order to support priority sectors, while also using green refinancing lines of credit as an instrument of industrial policy (Dikau and Volz 2021).

Thirdly, the emphasis in modern macroeconomic policy on a limited and short-run role for fiscal policy (and public investment more generally), and an independent central bank focused primarily on price and financial stability, limits policy coordination around financing and shortens time horizons. In contrast, in our case studies, policy coordination between MoFs, central banks and development banks played an important role in enabling credit to support industrialisation-led growth and full employment alongside price and financial stability. What is missing from current analytical frameworks is the question of broader strategic financial governance that can be deliberately designed to help achieve low carbon-based structural change. The notion of 'strategic financial governance' goes beyond coordination between policy tools (micro-prudential and green taxonomy) or policy domains (e.g. the fiscal-monetary axis), although these remain important. Instead, we suggest in this paper that the focus should be on various institutional forms that support the steering of financial systems towards low-carbon-based structural change. In particular, our case studies show how ministries of finance and central banks can take on economic development roles in a way they no longer do in advanced economies, and highlight the key institutional role of state investment banks.

Our case studies also demonstrate the emergence of conflicts and tensions relating to policy coordination. The financial governance of industrialisation historically involved conflicting objectives pursued by key groups of policy elites. Some scholars argue that industrial planners and financial policy makers at times held opposing views, with industrial planning agencies typically advocating pro-growth and pro-risk, and financial policy agencies holding to a more conservative approach focused on price and financial stability (e.g. Calder 1993) or with ministries of finance lobbying for more legal/formal credit policies and central banks opting for more market-based approaches (e.g. Moses 2000). In addition, tensions occurred during periods of high inflation when central banks typically wished to reign in credit or raise interest rates, but MoFs were more reluctant to do so given their stronger attachment to economic growth and employment. Nevertheless, none experienced the type of destructive hyper-inflation that defenders of central bank independence worry about. Indeed, there are very few examples of hyper-inflation outside war-time or similar regime-collapse scenarios (Hanke and Kruse 2013; Ryan-Collins 2015).

In large part, the finance regimes discussed in the paper appeared to be successful in supporting industry-led structural change, but strict capital controls were a notable feature in supporting domestic credit policies, helping to avoid substitution effects and ensuring full employment. To implement these types of policy today might also require some forms of capital control, in addition to dealing with the problem of the largely unregulated 'shadow



banking' sector (Ban and Gabor 2016). Interestingly, the IMF (2012) has recently shifted its strong opposition to capital controls, suggesting this may be another policy taboo that is loosening. Certainly, it is a topic that merits further research.

In this regard, an obvious place to start might be central banks' re-financing schemes. Indeed, the Japanese central bank has recently announced it will use targeted refinancing operations to support the transition to a carbon-neutral economy, making it the first major central bank in the world to do so (Bank of Japan 2021). The targeted long-term refinancing operations (TLTRO) of the European Central Bank (ECB) provides discounted funding to banks conditional on their lending to non-financial small and medium-sized firms and excludes residential mortgages and financial corporations.<sup>40</sup> A further 'targeting' could also support banks if they lend in accordance with the EU's taxonomy of green activities (van 't Klooster and van Tilburg 2020). Rediscounting loans in this way played an important role in the Bank of Korea and Bank of Mexico's credit policy operations.

Central banks could also consider 'greening' the criteria for asset purchases undertaken during quantitative easing programmes and for the collateral they accept in return for funding (Dafermos et al 2020). Indeed, the Bank of England has recently embarked on such a policy, stating that it will begin excluding activities that 'Scientific evidence suggests are incompatible with reaching net zero by 2050,' starting with thermal coal (Bank of England 2021). More generally, central banks, financial supervisors and ministries of finance should now work to extend the proactive policy interventions and coordination demonstrated during the delivery of COVID-19 crisis response measures and their strategic commitment to the net-zero carbon transition. Further, the monetary policy review launched by the ECB and the rapidly developing discussions over its 'secondary mandate' — to support the broader economic policies of the EU — looks necessary and subject to further research (De Boer and van 't Klooster 2021).

Today, ministries of finance are playing increasingly prominent roles in environmental policies. For example, the European Emissions Trading System involved different EU ministers of finance shaping the rhetoric on climate finance, either as a fiscal cost or a policy response (Skovgaard 2017a, b). Raudla et al (2019) drew similar conclusions on the variety of roles of ministries of finance in shaping the response to the Global Financial Crisis: either austerity and financial prudence by 'guardians of the public purse' or more 'developmental' emphasis on structural balances and long-term objectives.

Shaping financial policy to support a net-zero carbon transition requires similarly strategic policy coordination across fiscal, industrial, financial and monetary policy agencies. This does not imply a continuous policy consensus, but involves inter-agency deliberation and at times contesting approaches, but without compromising the overarching and necessarily long-term-oriented policy objective (green transition, structural change), as our historical case studies demonstrate.

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<sup>40</sup> The fraction of eligible loans for which TLTRO were available has been raised over time by the ECB from 7% (TLTRO I, 2014) to 30% (TLTRO II 2016) and 50% (TLTRO III 2019). During the COVID pandemic the interest rate on TLTRO III was lowered to minus 1%, which means that the ECB pays banks 1% of the value of their loan every year (van 't Klooster and van Tilburg 2020: 6).

## 4.1 Caveats

The case studies discussed in this paper are not a representative sample. There are also examples of countries whose efforts to govern finance have been somewhat less successful. While Mexico and Brazil can be considered success stories, other Latin American economies that adopted similar types of policy, e.g. credit allocation policies or financial repression, did not industrialise so rapidly or effectively (Schrank and Kurtz 2007) and ran in to problems of high inflation and unemployment in the 1980s-1990s. Indeed, much of the empirical work that is referenced to justify the idea of central bank independence as a means to control inflation refers back to the experiences of South American countries in the 1980s (see e.g. Sachs 1986). The central argument here is the problem of political inflation — i.e. central banks were forced by governments to expand the money supply at certain times in the electoral cycle, leading to inflation and higher inflationary expectations. However, there is a lack of empirical evidence backing up such claims (Ryan-Collins 2015; 2017) and a number of other non-monetary explanations help to explain the Latin American inflations, such as the concentrated structure of land ownership and balance of payments constraints these regions experienced as their economies developed (see Vernengo 2006: 482-485 and the references therein).<sup>41</sup>

Our sample cases also adopted similar, export-oriented growth models (often combined with protectionist regimes for emerging domestic industries) to support their industrial transitions. In this they were no doubt aided by the opening of world trade during the 1970s and 1980s, which provided vast new export markets for manufactured goods in particular. Today, emerging economies seeking to stimulate green innovation and technology may find accessing such markets a more challenging task. Clearly, they lack the relatively low labour costs that our case study countries enjoyed at the time, and need to navigate within more complex global financial and knowledge governance regimes (e.g. WTO, TRIPS). On the other hand, the demand for green technologies is clearly set to grow and some European countries have already demonstrated the opportunity to generate considerable income from exporting such technologies, Germany and Denmark being obvious examples. In theory, developing countries can advocate for the opportunity to develop their own green industrial strategies to develop strong green exporting sectors. However, this will require a degree of fiscal freedom that may be constrained by the leading multilateral agencies which are focused on carbon pricing and fiscal prudence (e.g. Gabor and Weber 2021).

Our sample cases also adopted growth-first economic models and the high levels of growth achieved in the 20th century have been tied closely to the more efficient exploitation of fossil energy (Ayres and Warr 2010). A net-zero carbon transition may be unable to generate such high levels of growth and employment, even with directed finance, potentially limiting its democratic appeal. This points towards the need for a 'Just Transition' or 'Green New Deal' (Elliot et al 2010)

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<sup>41</sup> Under these approaches, industrialisation leads to a reduction in agricultural produce and a shift towards imported capital goods, creating supply-side constraints. This can lead to an increase in food prices (Cardoso, 1981) and a resultant reduction in real wages, which may in turn lead to pressures to increase wages above the indexation norm and wage-price spirals.

approach, with strong policy coordination focused on the creation of well-paid jobs in green sectors to counterbalance the rapid dismantling of unsustainable but labour-intensive sectors.

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## 5. Concluding remarks

The net-zero transition requires structural economic change within a rapid period of time. Whether private finance can be leveraged to achieve such a shift without a major role for the state, beyond efforts to de-risk investment and support price discovery, remains to be seen.

This paper has examined the governance of finance to support rapid economic transitions in the light of the current climate emergency and the need to transition to a net-zero carbon economy by 2050. Our case studies took what might be described as a ‘market-shaping’ (Mazzucato 2018) approach to finance, involving the creation of strategic public financial institutions targeting industrial development; the adoption of a range of credit policies to harness the private financial sector; and a high level of coordination between fiscal, monetary, supervisory and industrial policy. These arrangements helped these economies rapidly industrialise and take tens of millions of people out of poverty in a short space of time. No doubt other factors played a part in these successful, export-oriented industrialisations. Nevertheless, financial policy makers today can surely take note of the alternative, directed financial regimes these economies employed to support their transitions, noting the failures as well as the successes. We hope this paper stimulates further research on strategic governance of finance for economic transition.

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