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Signing of Regional Comprehensive Economic Partnership

The China Moment

By PETER KOENING*

China has achieved the almost impossible – a free trade agreement with 14 countries – the ten ASEAN, plus Japan, South Korea, Australia and New Zealand, altogether 15 countries, including China. The so-called Regional Comprehensive Economic Partnership, or RCEP, was in negotiations during eight years – and achieved to pull together a group of countries for free trade, i.e. some 2.2 billion people, commanding some 30% of the world’s GDP. This is a never before reached agreement in size, value and tenor. The RCEP was signed during the 37th ASEAN Summit on 11 November in Vietnam.



On top of being the largest such trade agreement in human history, it also associates with and binds to the Belt and Road Initiative (BRI), or One Belt, One Road (OBOR), or also called the New Silk Road, which in itself comprises already more than 130 countries and more than 30 international organizations. In addition, China and Russia have a longstanding strategic partnership, containing bilateral agreements that also enter into this new trade fold – plus the countries of the Central Asia Economic Union (CAEU), consisting mostly of former Soviet Republics, are also integrated into this eastern trade block.

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The conglomerate of agreements and sub-agreements between Asian-Pacific countries that will cooperate with RCEP, is bound together by the west a little-understood Asian Pact, called the Shanghai Cooperation Organization (SCO), founded on 15 June 2001 in Shanghai as an intergovernmental organization composed of China, Russia, Kazakhstan, Kyrgyzstan, Tajikistan, and Uzbekistan. The SCO's purpose is to ensure security and maintain stability across the vast Eurasian region, join forces to counteract emerging challenges and threats, and enhance trade, as well as cultural and humanitarian cooperation.

Much of the funding for RCEP and BRI projects will be in the form of low-cost loans from China's Asian Infrastructure and Investment Bank (AIIB) and other Chinese and participating countries' national funding sources. In the hard times emerging from the covid crisis, many countries may need grant assistance to be able to recover as quickly as possible their huge socioeconomic losses created by the pandemic. In this sense, it is likely that the new Silk Road may enhance a special "Health Road" across the Asian Continent.

The real beauty of this RCEP agreement is that it pursues a steady course forward, despite all the adversities imposed by the west, foremost the USA. In fact, the RCEP may, as "byproduct", integrate the huge Continent of Eurasia that spans all the way from western Europe to what is called Asia and covering the Middle East as well as North Africa, of some 55 million square kilometers.

The crux of the RCEP agreement's trade deals is that they will be carried out in local currencies and in yuan – no US dollars. The RCEP is a massive instrument for dedollarizing, primarily the Asia-Pacific Region, and gradually the rest of the world.

Much of the BRI infrastructure investments, or New Silk Road, may be funded by other currencies than the US dollar. China's new digital Renminbi (RMB) or yuan soon being rolled out internationally as legal tender for international payments and transfers, will drastically reduce the use of the dollar. The new digital RMB will become attractive for many countries which are fed up with being subjected to US sanctions, because using the US-dollar, they automatically become vulnerable to being punished with dollar blockages, confiscations of resources, whenever their international "behavior" doesn't conform with the mandates of Washington.

Even countries' reserves can be stolen, a crime perpetrated by Washington with impunity and with the help of the UK, in full sight of the world, stealing 1.2 billion dollars' worth of Venezuelan gold deposited with the Bank of England. Only a cumbersome lengthy legal process in UK courts initiated by Venezuela could eventually free the funds to be returned to the jurisdiction of Caracas. This is a warning for many countries, who want to jump the fiat-dollar-ship and join an honest trading and reserve currency, offered by China's solid and stable economy-backed RMB.

The dollar is already today in decline. When some 20-25 years ago about 90% of all worldwide held reserve-assets were denominated in US dollars, this proportion has shrunk by today to below 60% - and keeps declining. The emerging international RMB, together with a RCEP- and BRI-strengthened Chinese economy, may further contribute to a dedollarization, as well as dehegemonization of the United States in the world. Simultaneously and progressively the international digital RMB may also be replacing the US-dollar / euro reserves in countries' coffers around the globe.

The US-dollar may eventually return to be just a local US-currency, as it should be. Under China's philosophy, the unilateral world will transform into a multi-polar world. The RCEP and New Silk Road combination are rapidly pursuing this noble objective, a goal that will bring much more equilibrium into the world.

For the West adapting to this new reality may not be easy. Cooperation instead of competition has never been a Western concept or philosophy. For hundreds if not thousands of years the

western dominance has left a sad legacy of exploitation of the poor by the rich colonial masters and of bloody wars.

Cooperation instead of competition and warring for power, is a concept not easily adhered to by the west. It is clearly visible by US-instigated trade wars, and possibly a currency war between the US and China may already be in the making. The FED has vaguely expressed its plans to also launch a digital, possibly cryptic, blockchain-based currency to counter the new RMB – not yet even launched internationally. Details of the FED's plans are at the time of this writing not clear.

Having to adapt to the new RCEP, conforming to an agreement among equals, will not come easy for the West. The West will not let go and may use to the utmost possible, its creation and western biased World Trade Organization (WTO), to sabotage as much as possible the RCEP's trade deals and BRI-infrastructure, as well as cross-border industrial development advances.

The West, led by the US – and always backed by the Pentagon and NATO, may not shy from threatening countries participating in China's projects, but to no avail. Under Taoist philosophy, China will move forward with her partners, like steadily flowing water, constantly creating, avoiding obstacles, in pursuit of her noble goal – a world in Peace with a bright common future.

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In conclusion, the RCEP is a Chinese Masterpiece with Chinese characteristics and is paving the way for further progressing towards a world community with a shared future for mankind. The underlying principle is a community of sovereign nations, living, working, building, inventing, creating and culturally enriching each other in peace.

Complementarity between Regional Comprehensive Economic Partnership, the Belt and Road Initiative and Internationalisation of RMB

By HERBERT POENISCH*

A new world order where China leads the way has only just begun, with RCEP and BRI joining the existing China-led organisations. These are the Shanghai Cooperation Organisation (SCO), the Asia Infrastructure Investment Bank (AIIB) and New Development Bank (NDB). These are only regional organisations. On the global scene China, for the time being, has to join and work with the existing multilateral setup, mostly dominated by Western powers. China has also exerted influence by an increasing number of executive posts at international organisations.

While this approach makes sense in the medium term, playing by international rules on a global scale, while setting regional rules, China can cement its leading position in the region under certain conditions which will be spelt out below. Both new regional organisations under the aegis of China offer a chance to underpin the already undisputed economic leadership of China in Asia. It will supplement physical infrastructure investment in progress with further trade integration and other areas of cooperation to strengthen connectivity among partner countries in the Asian region.

The issues under investigation here is how these three strategies, RCEP, BRI and RMB internationalisation can complement each other to achieve the mutually beneficial goal for increasing welfare among partner countries. There will be four parts, first the characteristics of RCEP, the characteristics of the BRI, the present state of RMB internationalisation, all compared with historical examples and finally, how to mobilise synergies between the three, complementing and re-enforcing each other. The working paper in this issue below ‘Does regional currency matter for regional trade integration’ addresses the RCEP and RMB internationalisation.

1. Characteristics of RCEP

The signing of the RCEP comprehensive agreement in November 2020 among 10 ASEAN members and 5 major Asian countries aims at strengthening further integration by promoting free trade and investment as well as covering other areas supporting trade in goods and services such as rules of origin, customs procedures, sanitary measures, standards. RCEP goes even further than existing free trade agreements (FTA) as the name ‘comprehensive’ implies. It includes investment, intellectual property, electronic commerce, competition, small and medium enterprises, regional supply chains, market competition, and government procurement.

There are already a number of regional free trade agreements (RTA) in various regions of the world. These are the European Free Trade Area (EFTA), which paved the way for some members to form the European Union (EU) and the wider European Economic Area (EEA). In the Americas there are NAFTA, but also Mercosur and in the Caribbean CACM and CARICOM. In Africa there are COMESA, ECOWAS and SADC. The Soviet Union was succeeded by CIS and Eurasia. Gulf

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countries signed up to the GCC. In Asia the precursor of RCEP is ASEAN plus one (ie China). All these regional RTAs have notified and are recorded by the World Trade Organisation (WTO).

Regarding currencies, most RTAs use the USD but also the currency of the dominant country as unit of account and settlement, such as SADC which uses the South African Rand and the EU which even created a common currency, the euro. The working paper on regional currencies and regional trade has table 3 on usage of regional currencies in various RTA.

The European Union is a unique regional experiment beyond a free trade area. It was based on common values among the founding members but has been seriously hampered by new members joining which do not fully share these values. The result is an organisation for

strong internal investment, such as through the European Investment Bank (EIB), free trade in goods and services among members and a regional development budget for weaker members of the community.

Some members have even joined a common currency area. Many other areas such as fiscal policy and social policies remain in the national domain. The welfare gains for EU members have been undisputed throughout the region.

The RCEP proposal has similarities, joint investment projects to strengthen links and connectivity between countries, moving towards free trade and investment, without infringing on national sovereignty regarding labour, environment, role of the state sector and other areas. A number of RCEP chapters, such as competition are not subject to the dispute settlement chapter.

2. Characteristics of the Belt and Road Initiative

It is not quite appropriate to call the BRI in its present form a regional multilateral arrangement, as it is a sum of bilateral agreements between China as donor and the recipient countries. It includes countries in other regions of the world among its 70 members. It has five key cooperation priorities, policy coordination, facilities connectivity, unimpeded trade, financial integration and people to people contacts. It has no formal institution, but is under the leadership of the China National Development and Reform Commission (NDRC) as well as the State International Development Cooperation Agency (SIDAC), thus firmly based in the Chinese government structure.

Equally, the funding and thus all risks remain with Chinese institutions, such as the three policy banks ABC, ExImbank, CDB, the major state owned banks ICBC, BOC, CCB, two state owned funds, the China Investment Corporation (CIC) and the Silk Road Fund (SRF), and finally three international development banks, the AIIB, the NDB and ADB. The latter have their own risk assessment.

From its five cooperation priorities it could, however, evolve into a multilateral arrangement with far reaching integration among partners, even further than the EU. Policy coordination among partners is a tall order and difficult to achieve among such diverse countries as the BRI beneficiaries. In the same vein, facilities connectivity will need derogation of national rights in many domains, such as water, energy, transport, communication etc. The need for unimpeded trade is the objective of the RCEP and requires progress in most chapters of the agreement. While RCEP aims at liberalisation of financial services, the BRI aims at financial integration, including coordination of monetary policy and set up of financial institutions. Such ambitious endeavours are difficult even in the EU, where coordination of monetary policy among euro members and non-euro countries and setting up financial institutions under the EU passport scheme are ongoing challenges. Finally, the demand for people to people contacts is also included in the RCEP under movement of natural persons.

The present undertaking follows historical examples where prosperous countries entered into generous arrangements with partner countries for the benefit of allegedly both, donors and

recipients. In the 18th and 19th century the colonial powers, first and foremost, Britain undertook extensive infrastructure projects in its colonies for a one sided benefit. Another example is the US foray into Latin America in the early 20th century, another one the generous assistance of the Soviet Union to countries in its orbit, but also the Japanese attempts to share their prosperity with selected Asian countries. In all these cases, the experiments ended up with losses on the side of the donors and disappointment of both sides. The imbalance of economic and political power prevents the evolution of a real partnership, except under Marshall Plan type arrangements.

China has pledged USD 1tr or 6.6% of its 2019 GDP for the BRI projects, most of them in the form of loans, with some concessions. Loans have been extended mostly in USD by the financial institutions above. This creates additional risks as neither donor nor recipients can create this currency. Rather both of them might suffer liquidity shortage such as during early 2020.

Indicators show that China is already experiencing some limitations, with new lending for BRI projects being cut back by one third in 2020. Reportedly renegotiated projects reached already 25% of the total. In addition, extending the donor ship to other countries as was offered in the BRI Forum 2019 has not materialised. Regarding progress there have been no new entries on the BRI website for 2019 and 2020. Not even the Joint Communique of the 2019 BRI Forum has been posted. It seems that there are now news since August 2018.

There are indications that there has been a reassessment of risk borne by the Chinese financial institutions, first and foremost the policy banks and the major commercial banks, but also Chinese enterprises building the projects for which they receive domestic credit. The overall risk is borne by the Chinese central government which provides explicit and implicit guarantees.

It is suggested here, that turning the BRI into a transparent structure with well defined realistic goals with clarity as far as participants, projects as well as financing mechanisms would put the project on a sound footing, which can be paired with the RCEP. Overambitious targets and overlaps should be avoided.

A model which offers itself is the Marshall Plan after WWII. In that case, the donor country, the USA provided assistance to needy countries after the destructions of the war. Assistance was provided in the form of donations of a defined sum, amounting to 2% of US GDP at the time by the US Congress. The funds were in USD and channelled into the European Recovery Programme (ERP) which monitored the utilisation of funds. The aim was to assist countries in becoming mature trade and investment partners.

The USA realised that without such a programme, reviving trade would be close to impossible. The Plan originated from a 'mixture of national interest, prejudice, goodwill and misinterpretation of history'. In its result it 'should be thought of as a large and highly successful structural adjustment program'. At the time, the IMF, whose mandate was and is until today, the financing of structural adjustment and elimination of exchange controls just got off the ground. Thus the USA alone took on this ambitious project.

The USA insisted on multilateral trade policies replacing bilateral agreements and exchange control. Under US pressure the programme was institutionalised when the Committee for European Economic Cooperation (CEEC) was set up to ensure further European economic integration as condition for substantial aid. A permanent organisation, the future Organisation for European Economic Cooperation (OEEC) was set up in 1948. This was later converted into the present Organisation for Economic Cooperation and Development (OECD).

3. RMB Internationalisation

This strategy which was launched in 2009 developed momentum until 2015 but progress has been slow since then. The annual reports on RMB internationalisation by the Peoples' Bank of China and the International Monetary Institute which were published in mid year report progress in this area. It seems that the strategy has not had whole hearted support neither from official

players nor from the financial markets, this points to some doubts and concerns about the possible fallout from RMB playing an international role as reserve currency. The timid internationalisation of the JPY which never took off in the 1980 is still a vivid memory. These concerns are voiced by academics, such as the need to run current account deficits to provide the world with RMB liabilities. Practitioners worry about putting the national currency at the whims of international financial markets. Evidence of these concerns are the hesitant opening up of capital controls.

However, international financial markets have pushed Chinese authorities in the direction of a greater reserve role of the RMB. They are currently investing massively into Chinese assets, encouraged by the better performance of the Chinese economy, expectations of higher returns thanks to higher interest rates and expected appreciation of RMB. Chinese authorities have welcome these capital inflows, opening up on the inflow side. Foreign investors which make up only 4% of the Chinese stock market and bond market are not expected to cause increased RMB volatility. This share is low compared with 40% of US equity and 36% of US government bonds (down from 45% in 2008). Chinese authorities have mentioned a cap of 15% of government securities owned by foreigners. They have not yet acknowledged fully embracing the reserve currency role.

Both Chinese projects, RCEP and BRI do not explicit include the RMB internationalisation. RCEP could have stipulated an increased use of RMB for denomination and settlement of increased trade in goods and services. Only recently the enhanced use of the China Interbank Payments System (CIPS) for RMB clearing, together with other measure to boost RMB use has been postulated by the PBOC. However, the BRI financial cooperation priorities do not mention wider use of RMB for project financing. As the whole BRI is under Chinese control, it would be simple to impose RMB for accounting as well as settlement currency of BRI projects, as the USA insisted for its Marshall Plan assistance.

4. Complementarity between RCEP, BRI and RMB internationalisation

In their present form, there is limited complementarity between these two organisations. They can be pursued independently of each other. However, as China endeavours for a new world order it would make sense to make them consistent and mutually supporting each other.

There are major differences between the two organisations, such as the composition of members. While some homogeneity will help to move the common agenda forward, such as in the case of EU, the members of RCEP and BRI are a jumble of countries without much in common. The lack of a common purpose will not support a genuine partnership but lead to frictions sooner than later. The Chinese notion of harmony, which might be called a win-win situation might become threadbare soon.

While RCEP acknowledges that membership comprises countries at different level of development and the BRI strategy is clearly aimed at less developed countries, this offers only short term respite from unequal partnership. Most of them have one dominant partner facing a number of less developed dependents, rather than partners. Foundation ASEAN is burdened with countries at different stage of development, such as Singapore versus Laos at the extremes. Adding China to form ASEAN plus 1 has sharpened this disparity.

Whereas the RCEP is a multilateral agreement, the BRI is based on bilateral relations between China as donor and recipient countries, in a hub and spokes model with very limited links between the members on periphery. There is little transparency and contact between members on the receiving end. There is a lack of clear status of membership, no list published, no list of BRI projects with financing, let alone partners, such as creditors and debtors, contract details and conditions.

Regarding investment, the RCEP contains provisions covering the four pillars of investments: protection, liberalisation, promotion and facilitation. These go beyond their multilateral obligations under the WTO Trade Related Investment Measures (TRIMS). So far BRI projects have no such safeguards and are subject to an undisclosed bilateral agreement between the donor, usually a Chinese enterprise, the Chinese government or a Chinese bank and the recipient, usually a government or government sponsored enterprise. Complaints have been aired that there is no tender and transparency of conditions which are subject to bilateral negotiations. Implementation is by Chinese enterprises and financing is provided mainly by Chinese banks, including the policy banks.

Moving forward in making RCEP, BRI and RMB more complementary the following steps should be taken. BRI should create the physical infrastructure first and foremost in the transport, energy and communication sectors plus digitalisation. RCEP should facilitate trade, investment and other applications such as telecommunication along these new lines of connectivity.

4.1. Refocus the organisations

While RCEP has been signed and is in the process of ratification by members countries, the changes would affect mostly the BRI and RMB strategy. The BRI should be set up as a separate multilateral organisation, with a clear mandate, operating principles and secretariat. The Marshall Plan could serve as a case study.

The aim should be confined to investment and connectivity only. The other cooperating priorities should be dropped. Policy coordination is a tall order which touches on national sovereignty. Unimpeded trade is the main aim of RCEP. Equally, financial integration should be taken from the annex on financial services in RCEP. There should be no references to monetary policy or criteria for setting up financial institutions. These touch again national sovereignty. Finally, people to people bonds are included in RCEP under the Temporary Movement of Natural Persons chapter.

The mandate should be a partnership, similar to RCEP with a number of donors and partners. The mandate should be confined to creating the physical infrastructure and connectivity such as the digital silk road. The mandate should clearly stipulate that the physical infrastructure should allow recipient countries to graduate into genuine partners. Only if they can efficiently use the real infrastructure to strengthen their position as trading partners will they be able to generate enough income to service their debt. Some projects might have to be scaled back to ensure sustainability.

The operating principles should include the usual project parameters. These cover tender processes, technical specifications, implementation schedule as well as after sales services. They would also state the financing terms, whether on commercial terms or with concessionary components. The projects should be denominated and financed in RMB, thus boosting its internationalisation. Using RMB has the clear advantage that exchange rate and liquidity risk are reduced. Chinese enterprises account in RMB and financing institutions have ample RMB liquidity. Reducing exchange rate risk will put Chinese bidders in a favourable bidding position.

A permanent secretariat would lend increased visibility to the BRI. This would make it easier to interact with other donors, who would be more inclined to join a transparent project in the tender process or as cofinancing institutions. The financial aspects of projects as well as the bilateral partners could be easily analysed and opened to foreign investors, such as through securitisation of BRI loans by the participating financial Chinese institutions. The BRI should use the present favourable attitude of foreign investors to Chinese assets. BRI could offer such RMB denominated assets with various forms of Chinese government guarantees.

For BRI member countries not joining RECP, such as in Africa, Middle East, Eastern Europe and the American continent, a BRI secretariat once set up could consider joining the UNCTAD

initiative ‘financing for development’. After all, UNCTAD is already working with the major international organisation in furthering partnership through trade and investment in an UN environment which China is broadly supporting.

Conclusion

In its present form the RCEP, BRI and RMB are standalone arrangements under Chinese leadership. It is up to Chinese authorities to adjust these programmes, to integrate them in order to achieve complementarity and to use the synergies for the common benefit. While it is clear that they support each other, it has been suggested here how to adapt them to become mutually supportive. Clarity of purpose, with explicit interlinked mandates, offering transparency of the mutual contributions will show China’s partners, first and foremost in the Asian region how enhanced infrastructure investment will allow trade to flourish. They will see that benefits will arise for both sides, the donors and recipients, increasingly putting welfare gains for all partners within reach.

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US Election

Division or Dialogue with China?*

By ANDREW SHENG AND XIAO GENG*

Joe Biden's presidency amounts to a golden opportunity to initiate a direct and honest dialogue with China on issues that require constructive engagement. But time is of the essence. If Biden begins his term by choosing division over dialogue, changing course will soon become difficult, if not impossible.

Americans don't agree on much of anything nowadays. Yet they are largely united in their belief that China represents an existential challenge to their country and the international order it has long led. This combination of internal division and external demonization has made the Sino-American rivalry increasingly inescapable – and potentially catastrophic.

America's internal divisions have been fueled in recent years by social media, which, by populating users' feeds with tailored content, creates "echo chambers" that reinforce, rather than challenge, their beliefs and values. When alternative ideas do make it into the echo chamber, they are often distorted or smeared. And when someone within the chamber calls into question shared beliefs, they risk being instantly ostracized or, in contemporary parlance, "canceled."

This ultra-reactive demonization of diverging views not only flattens discourse; it also narrows the space between disagreement and conflict – even violent conflict. Widespread frustration with leaders' failure to deliver justice, security, and opportunity heightens the risks further.

The same tendencies can be seen in America's approach to China. For example, the US State Department's just-released report, "The Elements of the China Challenge," villainizes the Communist Party of China, describing it as "unconstrained by respect for individual liberty and human rights."

The report also stokes fear of China's supposed "authoritarian goals" and "hegemonic ambitions," which imply a desire to infuse the US-led global order with its own social and political model. And it recommends that the United States build a united front against China, in order to secure – by military force, if necessary – "freedom" for the world.

None of this has gone unnoticed in China, which has been conducting its own, increasingly unfavorable assessment of the US. It now seems clear to China's leaders, citizens, and businesses that, far from a land of freedom and opportunity, the US is a deeply fragmented society, blighted by systemic racism, rising inequality, and a lack of common purpose – ills that have long been obscured by fantasies about the "American Dream."

Moreover, far from being the exemplar of democracy, the US has a highly distorted political system. Its institutions, including the Electoral College, the Senate, and the Supreme Court, and

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practices such as gerrymandering, strategic reduction of polling places, and onerous voter verification rules, mean that the majority does not always rule. Wealthy donors purchase influence, whether by financing campaigns or buying up the media.

As China has shed long-held illusions about the US, its hopes for a constructive bilateral relationship have diminished. To be sure, President-elect Joe Biden is unlikely to sustain the roller-coaster ride of surprise attacks, reversals, disruptions, and near-misses President Donald Trump engineered. But less chaotic does not necessarily mean less confrontational: Biden has called Chinese President Xi Jinping a “thug” and pledged to lead a coordinated campaign to “pressure, isolate, and punish China.”

So, China is preparing for the worst. This may mean a continuation of Trump’s trade war or more senseless finger-pointing over the spread of COVID-19. It may even mean military tensions involving Taiwan, the South China Sea, and China’s western borders.

But this does not mean China is stooping to American-style isolationism and demonization. On the contrary, despite the ham-fisted “wolf warrior” tactics of some diplomats, China has taken important steps to advance international cooperation in key areas of shared concern. For example, on climate change, Xi committed at the United Nations to achieve peak carbon-dioxide emissions before 2030 and to aim for carbon neutrality before 2060.

On trade, China has signed the Regional Comprehensive Economic Partnership, whose 15 member countries account for 30% of humanity. Much to the world’s surprise, it has also indicated that it might join the Comprehensive and Progressive Agreement for Trans-Pacific Partnership, which emerged after Trump withdrew the US from the original Trans-Pacific Partnership.

The US – which is struggling to get the pandemic under control, and seems to be headed toward a double-dip recession – would do well to take a similar approach. Trade is the only way it can escape its current economic predicament. That includes trade with China – the first major economy to recover from the pandemic shock, and the only one to record positive GDP growth in 2020.

But this will be impossible, as long as misapprehensions, antagonism, and mutual suspicion dominate the bilateral relationship. As former Secretary of Defense Jim Mattis said, the US has two key powers: the power of inspiration and the power of intimidation. In dealing with China – an economic powerhouse with a population of 1.4 billion – intimidation will not work. China will not be cowed into submission on its domestic affairs, such as Hong Kong, Xinjiang, and Taiwan.

There is still time, however, for the US to use the power of inspiration to show that it and China can be equal partners in peace, working together to confront shared challenges. There is a moral dimension to this imperative. Many outsiders, including Chinese, cannot comprehend how the world’s most technologically advanced country could have allowed over 260,000 people to die from a virus that much poorer countries have combated far more successfully with simple measures. For cooperation to work, the US needs to demonstrate its ability to think in terms of “we,” rather than “I.”

As Rabbi Jonathan Sacks explains, “The world is divided into the people like us and the people not like us, and what is lost is the notion of the common good.” China’s enduring commitment to multilateralism indicates that it recognizes this. It is time for the US to do the same, and to embrace a direct and honest dialogue on issues that require constructive engagement.

Biden’s presidency amounts to a golden opportunity to initiate this crucial conversation. But time is of the essence. If Biden begins his term by choosing division over dialogue, changing course will soon become difficult, if not impossible.

Biden, and Global Trade Architecture^{*}

By CHUL CHUNG^{*}

Following the 2020 United States presidential election, economists have high hopes for the president-elect, Mr. Joseph Biden, and for the next US administration. The hopes are especially for the potential changes in the global trade architecture. Over the past four years the Trump administration dismayed and created confusion in the world economic order and multilateral trading system (MTS).

Mr. Biden's policies are bundled under the slogan, "Build Back Better." Over 7.3 trillion dollars are to be spent on initiatives such as green infrastructure including the creation of clean-energy jobs, and in the area of housing, education and health care. The first order of these initiatives is centered on the US domestic economy such as recovery from the COVID-19 pandemic and an economic recovery plan for working families. At the same time, however, Mr. Biden has emphasized working with allies to create a rules-based system and rebuild US leadership on the global stage. As Biden has declared, "America is back and ready to lead the world."

There are quite a few outstanding issues in the global agenda. Other than the COVID-19 pandemic and its consequences on the world economy, global issues that call for urgent attention are climate change and the multilateral trading system. Mr. Biden vows to rejoin the Paris Agreement on his first day of office in the White House. During the election, Biden promised that the next US administration is committed to fighting climate change, reducing carbon footprint, and pursuing clean energy revolution. It has not been crystal clear, however, how he will tackle many outstanding issues concerning the MTS.

The multilateral trading system operated mainly by the World Trade Organization (WTO) is in crisis. Most outstanding issues currently facing the WTO include failure in trade negotiations and malfunction of the dispute settlement system, among others. The Doha Development Agenda (DDA) is the WTO's first and ambitious trade negotiation round, which began in 2001. Despite several efforts to conclude the Doha round, negotiations were put to an end without reaching an agreement, that is, a de facto failure of the DDA. Meanwhile, the Appellate Body (AB) of the dispute settlement system is defunct without a judge in the appeals body. Starting from the Obama administration's veto to reappointment of a South Korean AB member, the Trump administration has blocked further appointments of new judges. One of the reasons for the United States opposing the appointment of AB members is the "judicial overreach" issue. As a result, the AB has lacked a quorum to deliver decisions since December 2019, and now all seven seats are vacant with the last judge's exit on November 30, 2020. What is worse, the post of WTO Director-General, who is supposed to play a crucial role for the most needed reform and reinvigoration of the WTO, has stood vacant since August 31, 2020, after Roberto Azevêdo resigned from the position.

Obviously Biden is not going to be panacea to all the global issues outstanding. Even if America returns to the global stage with Biden's new policy initiatives, it would be hard to imagine the world going back to the pre-Trump era. One of the most notable conflicts is trade disputes between the United States and China and strategic competition in technology and security. The problem is aggravated by the reality that it is not just a problem of the Trump administration. For example,

^{*}This article appeared in KIEP Opinions on December 10, 2020.

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the US Congress recently unveiled legislation of the 2021 National Defense Authorization Act (NDAA) and the Holding Foreign Companies Accountable Act. Evidently, they represent growing bipartisan pressure on China. According to the Pew Research Center, negative evaluations of China have increasingly climbed within the US, in particular 20 percentage points up during the past four years of the Trump administration.

Mr. Biden apparently thinks that the US administration alone cannot achieve the goal of restoring the international economic order and the MTS, as well as dealing with conflicts with China. There should be enormous efforts made by major stakeholders across the globe. For this reason, he has emphasized international cooperation, particularly with allies who share the values of democracy and the market economy system. In order to tackle global outstanding issues, the Biden administration is expected to adopt an institutional and multilateral approach with more predictable policies that are rules-based. Most of all, a trust-rebuilding process must be the first step for WTO reform. Establishing a transparency-enhancing mechanism is also needed. The signing of the RCEP Agreement among 15 Asian countries including China, together with President Xi's recent statement that China is considering joining the CPTPP, might precipitate the Biden administration to prepare for a "return" to the Asia Pacific region earlier than anticipated. It is still unknown, however, in what form the US will come back to the region. No matter what form it takes, high hopes for the new US administration are linked to the statement, "Build Back Better" for more systematic and stable global trade architecture and constructive cooperation in the Biden, and Global Trade Architecture region.

China

10 Reasons Why Renminbi will Keep on Rising*

By DAVID MARSH*

In the months before the US presidential election, the general view took hold that, should Joe Biden win, one area of continuity with Donald Trump would be in policies on China. With the former vice-president moving into the White House on 20 January, there will be tension, even confrontation, over China's assertive foreign policy, human rights, trade, technology and espionage. But, based on early statements from both sides, the relationship between the two major world players will be more organised, less chaotic and more stable than under Trump. Against this background, the factors behind renminbi realpolitik look positive. There are many imponderables, not least question marks over the stability of the Chinese financial system epitomised by the lack of full renminbi convertibility, doubts over productivity growth and the huge build-up of debt. There will be plenty of bumps along the way. But here are 10 reasons why the Chinese currency's importance on the world stage – and its value – are likely to keep on rising in coming years.

1. China over the past 10 years has recognised the geopolitical merits of attaining reserve currency status – and this is likely to continue. As I wrote in a 2011 OMFIF paper, internationalising the renminbi 'would set down a convincing and consistent framework for China's financial interactions with the rest of the world, corresponding to the full potential of its political, economic and monetary ambitions.' China did a deal with Barack Obama's administration in 2015-16 over admittance to the International Monetary Fund's currency basket, the special drawing right. Greater transparency (for example, over monetary reserves and other statistics) and market-opening were effectively traded for recognition as a member of the reserve currency 'club'. Broadly, the bargain has worked, although much more needs to be done in advancing domestic market reforms. Further developments will ensue – even though it will be many years before China can come close to its long-term aim of toppling American currency supremacy.

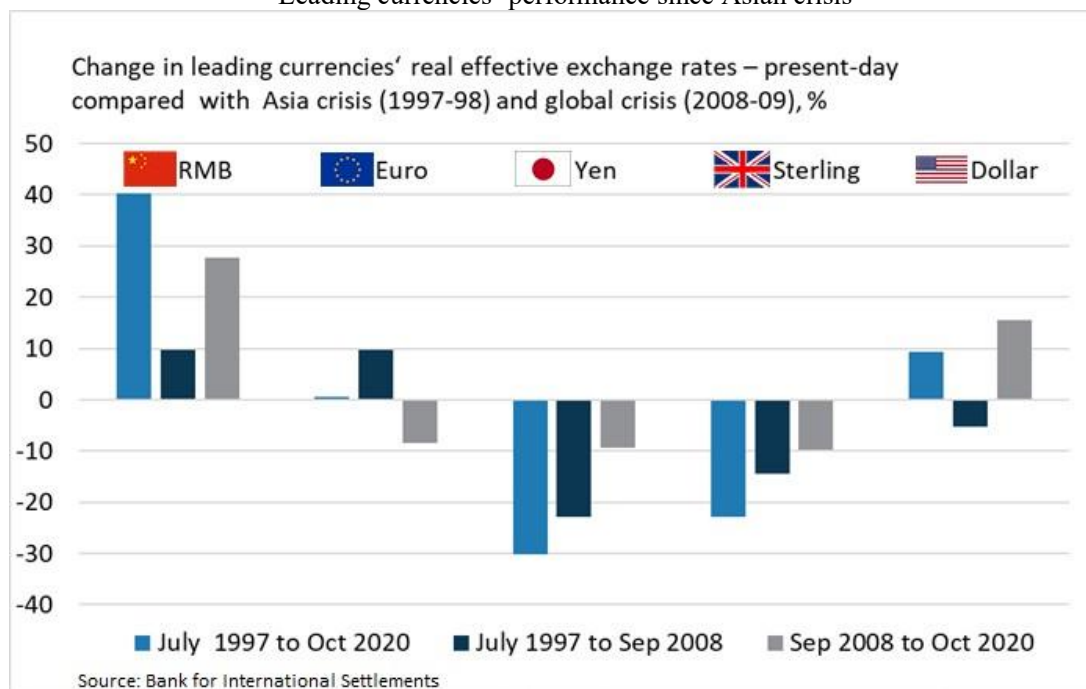
2. Once again – as after the 1997-98 Asia crisis – international fears that the Chinese would attempt to seek a competitive advantage through currency devaluation have been scotched. As OMFIF authors have consistently pointed out, worries about 'weaponising' the currency have been overdone. Allegations that Beijing was manipulating the currency to maintain undervaluation may have been true in the past – but the period of steep foreign currency reserve accumulation ended in 2014. Compared with the period of maximum anxiety in autumn 2018 (a time of dollar appreciation) over fears the Chinese were depreciating the currency to steal competitive advantage, the renminbi has gained more than 4% on a real (inflation-adjusted) trade-weighted basis, according to Bank for International Settlements indices.

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3. The People's Bank of China has recognised that renminbi appreciation would help control inflation as well as foster a planned shift in economic focus away from external and towards domestic demand. As OMFIF US Chairman Mark Sobel has written, 'Its policy, particularly after the 2005 revaluation, was to move to greater market orientation.' This has been part of a long-term drive to gain political and financial clout; Beijing officials have spoken about making the PBoC the 'Bundesbank of Asia'. Following previous clear undervaluation, BIS statistics (see chart) show that the currency has risen 40% in real trade-effective terms since the 1997-98 Asian financial crisis and 28% since the 2008-09 upset – significantly outperforming all other reserve currencies. The pace of appreciation will slow – but the legacy is likely to prove long-lived.

Leading currencies' performance since Asian crisis



4. Although at the heart of the Covid-19 outbreak, China is the first major economy to escape from this year's severe downturn. It will be the only big country recording economic growth this year, at around 2%. It offers investors a positive interest rate and the prospect of some currency gain. The economy expanded 4.9% in the third quarter, and is headed for further normalisation in the final three months of 2020, avoiding the second wave of the disease that has sparked renewed fears of recession in Europe and other regions. This has allowed officials such as Yi Gang, PBoC governor, to exude strong elements of self-satisfaction: 'China's continued recovery will benefit the world.' This year's growth has, however, been strongly export-led – a negative factor for the world economy, countering the effort to gear Chinese growth more to domestic demand. Veteran China-watcher Michael Pettis, in an OMFIF podcast, says it is running a trade surplus of 6% of GDP, a level he calls unsustainable.

5. China appears to have profited from 'trade wars' with the US, while many American firms have lost out. This development has borne out scornful predictions early in the Trump administration from Chinese officials and some foreign trade experts that the president's policies would 'make China great again'. China's 2020 foreign trade surplus with the US is likely to be around \$310bn, only a little lower than the \$346bn in 2016. Chinese exports to the US in May-October 2020 were 4% higher than the same period in 2019, according to US census bureau figures,

after both countries recorded steep falls in exports and imports over the previous three years. US exports to China were up 21%. In its overall foreign trade, China's industrial growth this year has been accompanied by booming exports. Despite the rising renminbi, China's share of global exports is now at its highest on record, according to Oxford Economics. The risk for 2021-22 is that, as the Covid effect fades, market participants could cease to regard the renminbi as a one-way bet and the currency could fall again as it did in 2014-16 and 2018.

6. US and other large asset owners, managers and banks are profiting from China opening its asset management and bond markets to allow foreigners access to what is set to become the world's second biggest capital market. October's four-and-a-half-times-oversubscribed \$6bn China government bond offering, 15% of which was sold directly to US investors, was a signal of success. A €4bn offering in November drew €17bn worth of bids at declining yields – a further sign of Beijing's efforts to diversify funding sources and capitalise on foreigners' demand for higher-yielding instruments. In tandem with this foreign currency fund-raising, the PBoC has been enacting measures since August to boost allocation of renminbi assets to foreign investors. A well-functioning liquid domestic bond market is a prerequisite for further currency internationalisation – an area where China has much ground to make up. One setback causing headaches has been a series of bond defaults in recent weeks by state-owned companies, although this is part of an effort to strengthen governance among Chinese issuers.

7. Domestic bond market opening runs alongside efforts to increase the renminbi's appeal as a reserve asset. The euro, making up around 20% of world reserves as the number two after the dollar, may make up some lost ground. But worries about uneven euro area recovery, negative interest rates, European Central Bank power struggles and unsteady European recovery fund progress will hamper any advance against the dollar. The renminbi starts from a much smaller base – 2% of world reserve assets, according to the IMF, double the figure three years ago – and therefore gains will be proportionately larger. Insufficient convertibility still holds it back. Probably two decades will elapse before the renminbi has a chance of overtaking the euro as the dollar's main challenger. Yet the gap with both the US currency (61% of international reserves) and the euro is likely to shrink.

8. Constraints on China's investments abroad have temporarily halted the country's attempt to make a better return on its foreign assets – one of its strategic aims of the past decade. Beijing can be expected to seek understandings with the Biden administration to intensify beneficial technological exchanges, for example in bringing capital from both countries into high-tech start-ups. This will be important if the two countries stake out common ground on investments countering climate change. China's stock market offers foreign investors the chance to hedge their bets against overreliance on US tech firms. Access to the Chinese equity market – directly and through Hong Kong – will increase in depth and breadth. Belying talk of financial 'decoupling', a host of Wall Street firms – including JP Morgan, Morgan Stanley, Goldman Sachs and Citicorp – has been allowed to take control of their securities operations in China. Chinese companies' share listings in the US have accelerated during the Trump presidency. This may gain further momentum under Biden. Big questions remain on whether the US and China reach agreement on auditing issues for US listings, and whether the US forces Chinese companies to delist for failure to meet US securities law requirement.

9. The 11th hour November move to suspend the \$37bn listing of Ant Group, the financial technology conglomerate set up by entrepreneur Jack Ma, was widely interpreted as a setback for capital market development, as well as an attempt to reduce the power of China's richest man. Despite the embarrassment for China, the Ant listing postponement may turn out to be a step forward for the country's financial modernisation. Beijing officials hailed the decision as safeguarding investors' interests. It was driven by a realisation that potential subscribers had not

been sufficiently informed about Chinese regulators' rulebook changes likely to significantly impede Ant's lending business. The authorities are belatedly getting to grips with the complexities of running a modern international capital market. In similar fashion the much-publicised, ill-communicated renminbi 'devaluation' of August 2015 was blamed at the time for catalysing a mini-slump on global stock markets. The episode was re-evaluated afterwards as a necessary, if poorly executed, step towards a more market-orientated exchange rate framework.

10. The digital renminbi will be a major advance, especially for trading relations with Asian partners. The scope of a Chinese digital currency will be enhanced by the Chinese authorities' supreme command of the economic and political system. Although worries about state control will impede some foreign usage, a digital currency will bring closer implementation of some longer-term strategic goals such the Belt and Road infrastructure initiative which Beijing officials years ago described as a means of establishing a renminbi zone in Asia and beyond. The BRI is running into obstacles, with massive Chinese lending to over-indebted emerging market economies slowing dramatically, underlined by a Boston University study, and debt rescheduling looming. However, as Gary Smith wrote in an OMFIF commentary in November, 'Longer-term, the Belt and Road will provide the means for an expanded use of digital renminbi for making international payments, and in particular, remittances. The dollar dominates BRI trade and remittance flows. Beijing will be happy to see the renminbi have an expanded role.' There will be Sino-American co-operation in many areas – as well as abundant power tussles. Depending on how seriously the Treasury and Federal Reserve take this issue under Biden, digital money may emerge as a notable battleground.

Shedding Light on China's Capital Inflows*

By HERBERT POENISCH*

This year has seen massive portfolio investment flows into China. This has been driven by the Chinese economy's bright prospects and higher returns on investments, as well as the country's financial opening up and expectations that the renminbi will appreciate. The exact amounts are unclear.

According to the People's Bank of China, foreigners increased their holdings of Chinese financial assets from January to September by \$204bn. Of these, equities went up \$94bn and debt securities \$110bn. At 4%, these holdings represent a small share of total equities and debt securities, and are therefore unlikely to affect prices in the market. The share is higher for government bonds at 9% than for corporate bonds at 1%. Foreign exchange reserves and the balance of payments are not fully reflected in these figures, as some investments might be reinvested in China instead of crossing the border.

Over the same period, China's official foreign exchange reserves went up by a comparatively modest \$27bn, to \$3.142tn from \$3.115tn. This seems to suggest that the massive inflow was absorbed by the exchange rate and non-official holders rather than as addition to foreign exchange reserves. During this time, the renminbi rallied to Rmb6.5 against the dollar, from close to Rmb7, an appreciation of 7.7%. Markets could start driving China's exchange rate.

In the balance of payments portfolio, liabilities rose by \$66bn in the second quarter. This followed a trend from mid-2019, with inflows of \$44bn in the second half of that year. The first quarter of 2020 was a slight reversal of this trend. Foreign direct investments inflows and outflows were roughly balanced. However, other investments, such as overseas currency and deposits, loans and trade credit expanded by \$61bn, indicating a repatriation of incoming funds. This occurred in the books of financial intermediaries rather than in the official sector.

While this is not a complete picture, it offers some insights into Chinese authorities' strategy. First, they are not worried about renminbi appreciation or repercussions for the export sector. They want to demonstrate that renminbi investment is a two-way bet, encouraging market participants to hedge their foreign exchange positions.

Second, the inflows allowed Chinese financial intermediaries to increase their overseas holdings and lending without affecting foreign exchange reserves or the monetary policy framework.

Third, these moves demonstrate that China's capital account is opening up, though more on the capital inflows which are more or less liberalised than on capital outflows. While official institutions face hardly any restrictions on outflows, private residents are still subject to an annual \$50,000 limit.

Fourth, renminbi appreciation helps Chinese borrowers repay debt securities. Close to \$10bn in offshore corporate bonds, where stress has emerged in the domestic corporate bond market come, was due in 2020.

Finally, a stronger renminbi should help the currency's internationalisation, as holders of renminbi assets will be rewarded. For the partner countries in Asia as well as Belt and Road countries this means a sharper choice between following the dollar or the renminbi.

*This article first appeared in OMFIF Commentary on December 16, 2020.

Herbert Poenisch, member of IMI International Committee, former senior economist, BIS.

Financial Development, Technological Innovation and Consumption-led Growth*

By AGUSTÍN CARSTENS*

I want to thank the organisers, and in particular the People's Bank of China (PBC), for inviting me to join the annual Financial Street Forum. It is a great honour to be speaking at this important event. My only regret is that I am not able to join you in person. I still remember vividly the symposium on RMB internationalisation that the BIS co-organised with the PBC in Beijing one year ago. The BIS values its smooth and close cooperation with the PBC over the years. I hope that I will be able to visit you in China sometime soon.

Uncertainty has increased, hindering consumption-led growth

The Covid-19 pandemic has increased uncertainty and pressures on firms and households globally. Countries like China have shown that these problems can be overcome with strong policy measures. Like many other central banks, the PBC stretched far with policy actions to provide liquidity and support households and firms during the crisis. The latest IMF World Economic Outlook suggests that China is the only G20 economy which will rebound this year.¹ Other countries are learning from its experience.

The hope is that the uncertainty will subside globally over the next year. However, in the near term, the pandemic and the anxiety it generated will still dominate. In many economies, households have increased their precautionary savings and restrained their consumption. The latest data from China show that economic growth has been led by government investment in infrastructure, while consumer spending and activity in the service sector have struggled to keep up.

The short-term challenges posed by the pandemic have not kept China from continuing to pursue its longer-term reform agenda, which is to move to a more consumption-led growth model. Making consumption a stronger source of growth would help China's transformation to a service-oriented economy, create more internal economic stability and reduce the exposure to external shocks. Such rebalancing can also increase productivity and promote a more sustainable and environmentally friendly economy.

Many policy actions and reforms could be taken to help achieve this objective. I would like to highlight two of them today: financial market deepening and technological innovation as useful channels to support economic rebalancing.

A robust and efficient financial system can help with the economic rebalancing

After the Great Financial Crisis, China embarked on a multi-year programme to boost domestic consumption by promoting consumer credit markets, improving social safety nets, developing the service sector and raising household income from investments. But household saving rates remain high - particularly precautionary savings from lower-income households. If people's health and pension outlays were more secure, households could save less, as they would need to set fewer resources aside to deal with uncertainty. From a macroeconomic perspective, more secure social

*This speech was given at Financial Street Forum 2020 on 21 October 2020.

¹Agustín Carstens, General Manager of BIS.

²IMF, World Economic Outlook: a long and difficult ascent, October 2020.

protection could reduce the dependence on self-insurance, and bring the aggregate national savings to a level better suited to the country's development level and demographic structure.

The Covid-19 pandemic has heightened uncertainty and expectations of higher future health care and living costs, especially for the elderly. Therefore, accelerating the development of social safety nets in China, including a more efficient pension system, would have great benefits today. The crisis could thus have a silver lining.

A deeper and more diversified financial sector - including a more dynamic pensions market - has much to offer here. Insurance markets are an example. Without health insurance, all of us would be saving more individually than what is needed collectively. Well-functioning insurance markets that guard against risks of large, unforeseen medical expenses would thus help boost consumption.

China's financial markets have already deepened over the past few decades. Market capitalisation of credit instruments has increased by 27% annually between 2010 and 2019. Foreign participation has also increased. This more diverse investor base has enhanced market liquidity.

But more can be done to make financial markets both supportive of consumption-led growth and more resilient. According to a recent report by the BIS's Committee on the Global Financial System,² relative to its economic weight China still has a limited presence of domestic institutional investors, such as pension funds, insurance companies and other long-term asset managers. The organisational structure of markets matters as it has important implications for market liquidity, competition and efficiency.

In this regard, pension market growth can be a catalyst for developing deep and liquid capital markets. Institutional investors, including pension funds, can help improve market liquidity, contributing to depth of trading and the development of derivative products and hedging instruments. Professional investors also tend to focus on long-term investment potentials and thus help reduce herd mentality and irrational market movements.

A dynamic pension market brings other benefits. Pension funds tend to purchase bonds to back the steady cash flows for pension members, so their participation can support the development of bond markets and enhance the signals provided by market interest rates for the implementation of monetary policy. Meanwhile, greater use of equity markets, including more institutional investor participation and more sectoral diversity for listed companies, can help shift from capital-intensive growth to the more intangibles-intensive investment that caters to the modern service-based economy. By reducing the weight of the banking sector in intermediating savings, while increasing that of institutional investors, China can boost its long-term growth prospects and diversify its financial system. In addition, if the banking sector comes under stress, securities markets can also serve as a valuable spare tire.

In sum, by promoting high-quality savings for the long run, developing a dynamic and diversified pension market will help to remove uncertainties and concerns that are holding back current consumption and support China's efforts to rebalance its economy.

Technology could be a useful vehicle to channel reforms

How can technology help? We have already seen in China that technological advances have transformed the country's payment system and helped accelerate banking sector reforms. China now has a unique opportunity - as well as an added urgency - to leverage its vast digital ecosystems and new technology to broaden and deepen its health and pension services.

²Committee on the Global Financial System, "Establishing viable capital markets", CGFS Papers, no 62, January 2019.

Digital services can support health care provision. Before the pandemic, large technology firms in China already leveraged their networks of data collected from customers' online activity to enter the private insurance industry and insure the previously uninsured at affordable prices. This can be scaled up further. The pandemic has stimulated the development of virtual medicine platforms to ensure safe and quick doctor consultation.³ These have been facilitated in China by the authorities' decision to have public health insurance cover certain online medical services.

Digitisation can also boost financial literacy, by familiarising people with long-term financial planning, including retirement financing. Some big techs have offered robot-advisory services to provide users with retirement-related tools (such as saving calculators, comparative information about various pension products and general advice).

In the medium term, technological innovation can speed up pension reforms in China. For one thing, fintech solutions could address some pain points encountered in the ongoing reforms. As former PBC Governor Zhou Xiaochuan has pointed out, distributed ledger technology can be used to handle payments from multiple sources for a single insured person, thus enabling pension portability.⁴

The key is this: technology is a more and more integral part of our lives. Over the longer term, technology - together with financial sector reform - can help China transition to a more resilient service-based economy, and meet its sustainable growth objectives.

Conclusion

A robust financial system and a climate conducive to technological innovation - which the authorities in China have been fostering for some time - will be more beneficial than ever in the post-Covid-19 world. Together they can address three current challenges that China faces: reducing uncertainty and boosting consumption; bridging to the medium-term goal of consumption-led growth; and improving the quality of resource allocation in the economy.

We at the BIS will continue to do our part, from both our head and our regional offices, to foster cooperation among central banks around the world to support both financial stability and financial innovation.

Thank you.

³See C Cantú, G Cheng, S Doerr, J Frost and L Gambacorta, "On health and privacy: technology to combat the pandemic", BIS Bulletin, no 17, May 2020.
⁴Zhou Xiaochuan, "Facing up to pension reform", Caixin, March 2020.

Monetary Policy and Financial Regulation

Maintaining Sound Money Amid and After the Pandemic*

By AGUSTÍN CARSTENS*

Introduction

I would like to thank the Progress Foundation for inviting me to the 50th Economic Conference. It's a great honour to be here today at this round anniversary. Let me mention that we too are marking a round anniversary this year, the BIS's 90th, and we are grateful to the Swiss community for all the support you have given us over the years. The BIS has evolved over time to become a hub for central banks, with the overall goal of promoting global monetary and financial stability. Put differently, we aim to promote sound money worldwide. As the title of the conference suggests, sound money is a noble goal under constant fire and it is a continuous challenge for central banks to defend it.

For a long time, bringing inflation down and keeping it from rising was the main challenge faced by central banks. More recently, however, a new challenge has emerged: fighting persistently low inflation and economic stagnation in a low interest rate environment. The Covid-19 shock has massively compounded this challenge.

Central banks' response to the pandemic

The pandemic has been a threefold shock: a public health crisis, an economic sudden stop and, initially, a short-lived but acute financial crisis. The consequence is, according to current forecasts, the most severe global economic downturn on record, at least since World War II (Graph 1). The IMF currently expects global real GDP growth in 2020 to fall by 5%, with an 8% contraction in advanced economies and a 3% recession in emerging and developing economies (IMF, World Economic Outlook, June update).

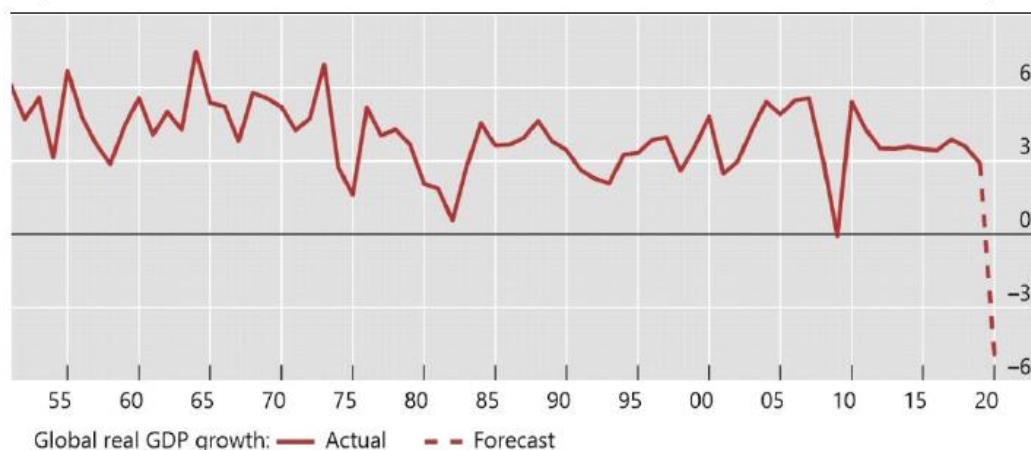
These numbers factor in the buffering effects of the unprecedented policy reaction. Governments have launched massive fiscal stimulus programmes. Central banks were again at the forefront, cutting policy rates where possible and launching large-scale balance sheet measures. A defining feature of the crisis response has been far-reaching direct support for households and businesses to limit social distress and avert unnecessary bankruptcies that could hold back the recovery.

*This speech was given at Progress Foundation 50th Economic Conference on "Sound money – a noble goal under constant fire" on October 8, 2020.
*Agustin Carstens, General Manager of BIS.

The coronavirus recession

In per cent

Graph 1



Sources: IMF, *World Economic Outlook*, June 2020; Maddison Historical Statistics; BIS calculations.

The pandemic's economic repercussions were propagated globally through large swings in capital flows and exchange rates. Emerging market economies (EMEs) confronted large-scale capital outflows and currency depreciation, contributing to a tightening of financial conditions and forcing many central banks to intervene supportively in currency and domestic bond markets. By contrast, safe haven capital flows have led to strong appreciation pressures on some advanced economy currencies, in particular the Swiss franc, forcing the Swiss National Bank (SNB) to intervene to stabilise the exchange rate.

Central banks' responses were instrumental in avoiding a financial meltdown and buffering the recession both domestically and globally. But difficult challenges loom large going forward. In the following, I would like to highlight two such challenges. The first consists in the prospect of interest rates staying very low for a very long time in major advanced economies. The second is the strengthening of the fiscal-monetary nexus brought about by the policy response to the pandemic.

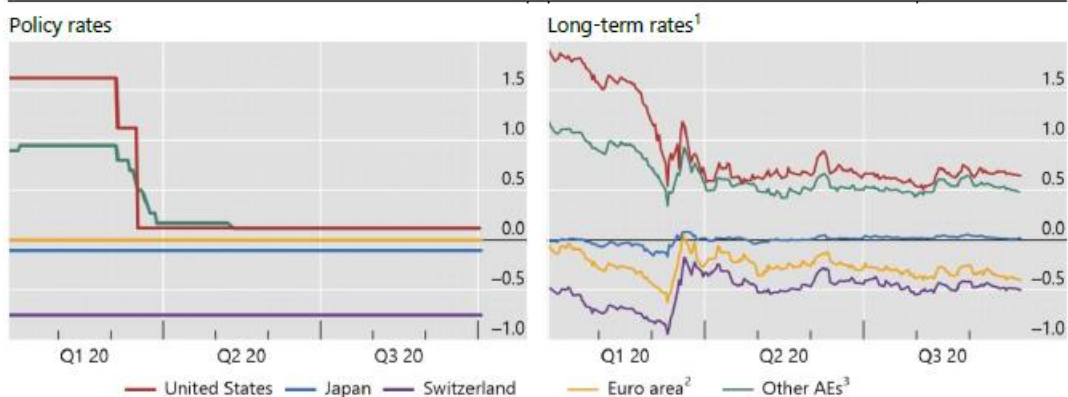
Low for very long

The pandemic has reinforced the low interest rate regime that has prevailed in advanced economies over the past decade. Short- and long-term rates are now at or near zero, or even below, in all advanced economies (Graph 2). After interest rates fell towards zero or below in Japan and in most European advanced economies over the past decade, they have now "zeroed in" across the board, including in the United States.

Low interest rates across advanced economies

In per cent

Graph 2



¹ Ten-year government bond yields. ² For long-term rates, simple average across DE and FR government bond yields. ³ Simple average across AU, CA, GB, NO and SE.

Sources: Bloomberg; national data; BIS calculations.

Forward guidance from central banks signals that, in the major economies, policy rates will remain low for years to come. In line with this forward guidance, and reflecting the currently bleak economic prospects, financial market prices suggest that both short- and long-term interest rates will remain at very low levels for the foreseeable future. The pandemic thus seems to have pushed the advanced economies from a low-for-long into a low-for-very-long interest rate regime. But this does not mean that central banks have run out of ammunition with both their conventional and unconventional tools. With their pandemic responses, central banks have shown that they can overcome the limits posed by very low interest rates and provide additional stimulus through innovative balance sheet policies, such as purchasing corporate bonds, or even by directly lending to firms.

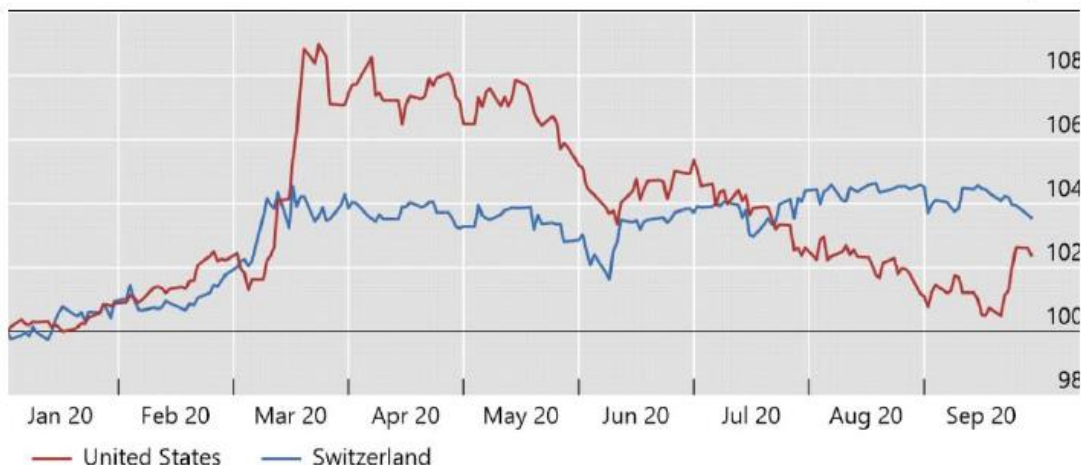
At the same time, even when long-term government bond yields are very low, this does not mean that central bank bond purchases cannot provide additional accommodation. During the pandemic, large-scale purchases by central banks helped to keep long-term bond yields low when the bond supply increased massively in the wake of the fiscal support. Without central bank purchases, bond yields would likely have risen, tightening financial conditions amid the pandemic.

That said, in a low rate regime, providing monetary stimulus is certainly harder. The exchange rate will, explicitly or implicitly, take on greater prominence in the transmission process and in policy deliberations. Indeed, since the outbreak of the pandemic, we have already seen large swings in global exchange rate constellations (Graph 3). In particular, the US dollar has fluctuated widely. It first appreciated sharply as panic spread in March, and then depreciated significantly when the pandemic's first wave ebbed.

Exchange rates amid the pandemic¹

1 Jan 2020 = 100

Graph 3



¹ BIS nominal effective exchange rate broad index. A decline indicates a depreciation of the currency in trade-weighted terms.

Source: BIS.

The outlook of prolonged low interest rates across all major advanced economies implies an environment of ample global liquidity amid high economic uncertainty. This combination may intensify the volatility of capital flows and exchange rates as market sentiment oscillates between risk-on and risk-off. For many EMEs, the main challenge will be the amplifying impact of capital flows and exchange rates on domestic financial conditions and the risk that inflation will become unanchored through large depreciations in the event of sudden capital outflows.

In small open economies with safe haven currencies, such as Switzerland, capital inflows during risk-off phases can quickly flood the country. Such floods can overwhelm the financial system's absorption capacity and lead to excessive appreciation pressure. If excessive appreciations drive the currency's value well above fundamentally justifiable levels, the economic consequences can be very damaging. They can sap exports and hence growth and employment, and they may even curb long-run growth potential if the viability of the productive export sector is undermined. At the same time, by depressing economic activity and weighing on domestic prices through the exchange rate pass-through channel, excessive appreciations can unanchor inflation towards the low side.

Clearly, in a situation when exogenous financial factors in the form of safe haven inflows threaten to push the currency far above its fundamental value, the central bank of a small open economy has no choice but to intervene to stabilise the exchange rate. With such FX interventions, the central bank is just following its mandate to safeguard price and financial stability.

Switzerland has been exposed to recurrent appreciation pressures since the Great Financial Crisis as safe haven inflows have shot up in several instances. The Swiss economy has weathered these pressures quite well so far. Inflation has been low and at times negative, but inflation expectations have not de-anchored from the SNB's target range. At the same time, the Swiss economy has continued to grow and unemployment has stayed low.

This resilient performance is in large part attributable to the SNB's determined and pragmatic unconventional policy response. This has centred on negative rates to discourage capital inflows and FX intervention to directly address excessive appreciation pressures. Like many other central banks, the SNB also faces criticism for the side effects of its policies, but I think everybody has to realise that these measures have been necessary to fend off material risks to the Swiss economy. In the end, negative rates and high FX reserves clearly appear to be the lesser of two evils, as compared with an unhindered appreciation of the Swiss franc, which would wreak havoc on the Swiss economy. Given the outlook of a prolonged period of very low rates in the major advanced economies, unconventional policies of this type will probably continue to be necessary in the coming years.

The fiscal-monetary nexus

Let me now turn to the second longer-term challenge for central banks brought about by the pandemic which I would like to highlight, the significant strengthening of the nexus between fiscal and monetary policy.

Central banks have launched renewed large-scale purchases of government debt as part of their crisis response, motivated by the stabilisation objectives within their mandates. As already mentioned, these purchases have coincided with massive increases in public debt on the back of the massive fiscal response. Hence, they have helped to smooth the impact on bond markets of a sudden ramp-up in fiscal spending.

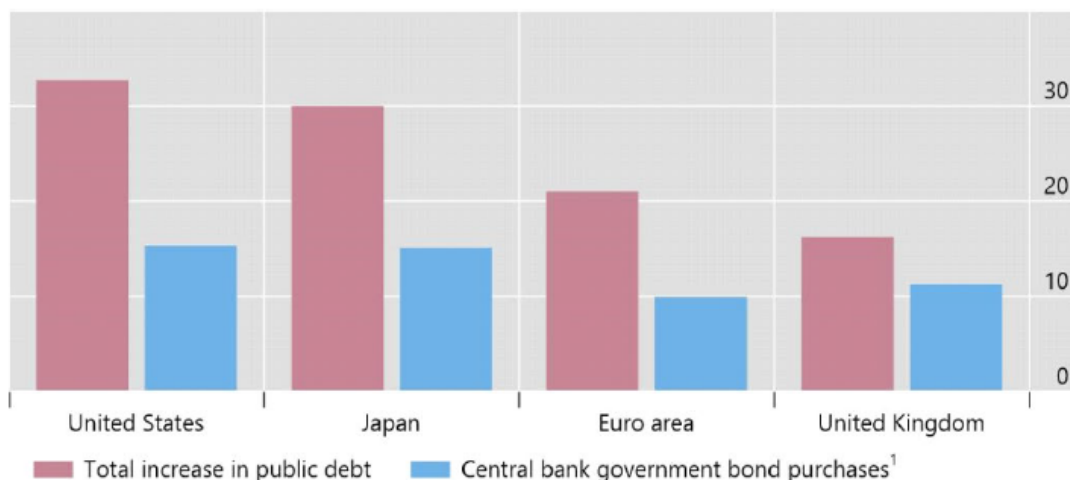
However, these purchases have also resulted in a significant increase in central bank holdings of government debt. According to current forecasts, a large part of the new issuance of government debt in major advanced economies is matched by central bank bond purchases (Graph 4). Thus, while they are grounded in central banks' stabilisation mandates, the purchases have strengthened the fiscal-monetary nexus.

At the same time, there is an ongoing debate about the need for greater coordination of fiscal and monetary policy in an environment of reduced policy space due to persistently low interest rates, with some pundits arguing in favour of overt monetary financing. This raises the general question of how central banks can best contribute to economic growth and stability, in the current situation and in general. Is it by directly financing the government?

The growing fiscal-monetary nexus

Forecasts for 2020, in per cent of 2019 GDP

Graph 4



¹ For projection details of central bank government bond purchases, see Cavallino and De Fiore (2020).

Sources: P Cavallino and F De Fiore, "Central banks' response to Covid-19 in advanced economies", *BIS Bulletin*, no 21, June 2020; IMF, *World Economic Outlook*, June 2020; national data; BIS calculations.

I will argue that the best contribution monetary policy can make is always to maintain sound money, to focus squarely on preserving price and financial stability. Support for the government is justifiable in the pursuit of these goals. Otherwise, the risk arises of real or perceived fiscal dominance undermining central bank credibility as the foundation of sound money.

The experience of many Latin American EMEs in the 1980s and 1990s tells a cautionary tale of fiscal-monetary interactions gone wrong, ending as these did in high inflation or even hyperinflation. Exchange rates and long-term yields are key barometers for credibility risks from the fiscal side. Growing concerns about fiscal dominance could lead to exchange rate depreciation and rising long-term yields, triggering adverse macroeconomic and financial feedback loops that would severely undermine the central bank's ability to provide much needed support.

How can the spectre of fiscal dominance be kept at bay? There are two main conditions, and both need to be met.

First, governments need to safeguard fiscal sustainability. If confidence in fiscal sustainability is in doubt, central bank credibility may suffer as expectations may arise that the central bank will have to support governments through accommodative policy. Governments must therefore be prepared to take pre-emptive action to ensure fiscal sustainability.

Second, central bank policy actions need to remain credibly focused on maintaining price and financial stability, as opposed to financing the government debt. Central banks' mandates and far-reaching institutional independence are essential for them to fulfil their stabilising role. At the same time, it will be of critical importance that the measures taken by central banks are also perceived as being in line with their stability mandates. Here, the credibility capital of a central bank plays a crucial role. In advanced economies, it may be possible for central banks to temporarily cross the boundaries between fiscal and monetary policy as they can rely on a high degree of credibility built on a long track record of stability-oriented policies. In contrast, despite

significant improvements over the past two decades, central banks in many EMEs are not in the same position and adverse market reactions will act as a brake.

Conclusions

Let me conclude. Overcoming the Covid-19 crisis will require us to navigate through uncharted waters, in poor visibility and with some instruments possibly not working to full effect. The initial responses of central banks to the crisis have been instrumental in fending off financial meltdown and in buffering the economic contraction. As we progress from the liquidity to the solvency and recovery phase of the crisis, the heavy lifting would normally shift from monetary policy to fiscal and structural policies. Of course, that does not mean that central banks can sit back and relax. They should be prepared to proactively supply further accommodation if adverse macro-financial feedback loops need to be forestalled.

That said, it is vital to recognise the limits of monetary policy. Monetary policy alone cannot deliver higher sustainable growth. Getting back on track will require governments to play their part. Structural reforms that raise potential growth rates are called for, as well as growth-oriented fiscal policies focused on public investment. Boosting sustainable growth is not only critical against the backdrop of the pandemic. It will also be key for getting us out of the low-for-very-long interest rate regime and for bolstering fiscal sustainability. That said, it is politically no easy task to agree and implement growth-friendly policies, and this has probably become even more difficult in the wake of the pandemic.

Sound money is the best contribution central banks can make to sustainable growth in the post-pandemic world. Maintaining it will require central bank independence and credibility to be preserved. To that end, the natural boundaries between fiscal and monetary policy need to be respected.

Finally, international cooperation is more important than ever to overcome the pandemic and its economic woes. It will also be the key to maintaining sound money. We at the BIS will continue to do our part, fostering cooperation among central banks from around the world to support the stability and soundness of the international financial system.

PBoC Looks to the Future*

By GEOFFREY YU*

On 23 October, the People's Bank of China presented several amendments to its governing law. Though the proposal introduced various changes, it also featured one important constant.

Like its predecessor, Chapter 5 of the latest law details the PBoC's supervisory responsibilities. Chapter 6 is a new section on the supervisory tools at its disposal.

The central bank's financial stability responsibilities remain unchanged. However, the proposal introduces 'macro-prudential management', as well as terms that have become familiar since the 2008 financial crisis, such as 'stress test' and 'counter-cyclical buffer'.

In truth, over the past few years the PBoC has been conducting stress tests as part of its annual financial stability review, and formally introduced a counter-cyclical buffer this year. These instruments are seen as a necessary part of any central bank's toolkit, but the PBoC felt the need to formalise its legal authority over these practices.

Despite tension between China and many G7 countries, on a central banking level, co-operation and exchanges remain vibrant. In its statement on the amendments, the PBoC openly cited the 2010 Dodd Frank Act in the US and the 2012 Financial Services Act in the UK as setting 'the trend in international financial regulation' and highlighted the role of the central bank in preserving financial stability.

Undoubtedly, Chapters 5 and 6 are where the PBoC has concentrated most of its efforts. Its supervisory powers have expanded exponentially, but only because the scale and scope of China's banking and financial services industry have done the same.

For example, articles 42 and 43 pertain to supervision of payments services and fintech. These terms barely existed 15 years ago. They are now fields in which China is a global leader. In this respect even with the new law, the PBoC is merely catching up to innovation.

According to China's governance framework, the PBoC is a government ministry under the State Council. As such, it is no different from other global central banks which are accountable to and receive their remits from their respective governments.

Central bank independence often refers to 'operational independence', where a central bank can set monetary policy and engage in other activities without interference.

The PBoC proposal seeks to achieve the same for the Chinese central bank as much as possible. It specifies its ability to 'independently execute monetary policy, carry out its responsibilities and engage in activities free from the influence or intervention of local governments, government departments across all levels, social groups and individuals.'

However, it continues to define itself as 'under the leadership of the State Council.' Having operational independence enshrined by law is, at least in theory, to give the PBoC the power to act in the interests of price stability and financial stability.

The latter is important should situations arise where decisions may prove uncomfortable for certain authorities (e.g., putting a local bank under enhanced supervision).

The PBoC's leadership has never hidden its scepticism of, even disdain for, quantitative easing and has been increasingly vocal about the side-effects of unconventional policy.

Even if it wanted to introduce QE, the central bank faces legal constraints. Article 32 of the new

*This article first appeared in OMFIF Commentary on October 28, 2020.

*Geoffrey Yu is Senior Europe, Middle East and Africa Market Strategist at BNY Mellon.

law is Article 29 of the previous law verbatim: the PBoC may not make an overdraft for the government, and may not directly subscribe or underwrite state bonds or other government bonds.

In contrast, the Federal Reserve Act allows any Federal Reserve Bank to ‘buy and sell...bonds and notes of the United States’. The UK Treasury maintains a ‘government overdraft account’ at the Bank of England, known as the ways and means facility.

Even if the law affords the PBoC enough flexibility to engage in asset purchases, the bank’s leadership would probably see such a step as highly damaging to its credibility and pursue other avenues first to ease financial conditions.

The PBoC law was first established in 1995 and last amended in 2003.

The latest review began last year as the central bank acknowledged that many of its de facto powers and operations were not even foreseeable 17 years ago.

The PBoC has given due deference to G7 peers and merely wanted to ‘catch up’ with legislative and governance terms. Yet, at the same time, it is trying to future-proof itself. The new law could be a good template for central bank governance in the 21st century.

PBoC Reiterates Intent to Deepen Market Reforms*

By CHEN JIA

China will continue with its prudent monetary policy this year, along with a deepened market-oriented reform of the interest rate system, the PBOC, said on Wednesday 6 January.

Monetary policy measures will be flexible, targeted, reasonable and adaptive, to ensure broad money supply and the growth rate of aggregate financing can match the higher pace of nominal GDP growth, the PBOC said in a statement after its annual meeting.

The PBOC will improve the market-oriented interest rate system and the transmission mechanism, promote loan prime rate, or LPR, the new benchmark lending rate in China, reform of which will lead to a market-based deposit rate, the statement said.

At its annual meeting held on Monday 4 January, the central bank reiterated the need to keep market expectations on an even keel and keep the renminbi exchange rate at a stable, reasonable level.

Monetary authorities will also take advantage of structural monetary policy tools this year, including relending and rediscount programs, and credit policy to support small and micro enterprises, it said.

From the beginning of this year, the PBOC has injected 40 billion yuan (\$6.2 billion) via reverse repo operations, in order to maintain sufficient liquidity and relatively lower market rates.

While the PBOC may shift to a less accommodative monetary policy stance in 2021, as China's macro outperformance over the rest of the world may last, it may still be too soon for interest-rate hikes, said Stephen Chiu, Asia forex and rates strategist of Bloomberg Intelligence.

"Instead, policy normalization may come in the form of tapering money and credit supply," he said.

Since the country has announced a target to achieve peak carbon emissions by 2030 and achieve carbon neutrality by 2060, the PBOC has vowed to promote the green finance system and strengthen international cooperation in green financing programs.

The State Administration of Foreign Exchange (SAFE), the nation's foreign exchange regulator, also held its annual meeting on Monday 4 January, during which it pledged to steadily and orderly open the capital account, along with the further opening up of China's financial sector.

"We should prevent risks from abnormal cross-border capital flows and pay closer attention to external shocks from the COVID-19 pandemic," SAFE said.

*This article first appeared in China Daily on January 7, 2021.

Financial Stability Implications of the Pandemic*

By IGNAZIO VISCO*

It is a pleasure for me to open the second conference on “Financial Stability and Regulation” organised by Banca d’Italia and the Baffi Centre for Applied Research on International Markets, Banking, Finance and Regulation. This event could not take place in March in Rome as we had all wished. But it is taking place today with its original programme, albeit in a virtual format. I want to thank the organisers at Bocconi and at the Bank for their efforts, the contributors to the five sessions, and the keynote speakers. The papers that will be presented today and tomorrow will cover financial stability and regulatory issues that have been hotly debated over recent years. The keynote lectures will address forward-looking issues on the implications of Fintech competition on payment systems, the determinants of the low price-to-book ratios observed in the banking sector, and the challenges to central banking and financial stability created by climate change.

In these brief remarks I will focus on the financial stability implications of the outbreak of the current pandemic. This is of course a topic not explicitly covered in the sessions of this conference. Last November, when the call for papers was closed, nobody could have anticipated the events that would then unfold. But this does not mean that the discussions that will take place during this event will have no relevance to current financial and policy developments. On the contrary, many of the topics that will be covered in this conference – like the pro-cyclicality of loan loss provisioning requirements, the challenges associated with the rapid adoption of new technologies in the banking sector, the effects of bank dividend pay-out policies, or the implications of rising corporate solvency risk on banks’ balance sheets – have been and will continue to be at the heart of the debate on the policy response to the Covid-19 crisis in the coming months.

The spread of the Covid-19 disease and the necessary lockdown and social distancing measures adopted to contain it have triggered a contraction of the global economy of unparalleled magnitude. The reaction to the uncertainty and risks surrounding the initial stages of the Covid-19 outbreak led to serious liquidity strains in global financial markets. The traditional flight-to-quality behaviour among investors during stress episodes was followed by an unprecedented “dash for cash” in which even US Treasuries became illiquid. The lockdown measures adopted in many countries in the following weeks halted economic activity in several sectors, triggering massive increases in (observed and disguised) unemployment and plummeting corporate sales. Without policy intervention, a credit crunch would have unfolded and households’ and firms’ cash shortfalls would most likely have led to a large wave of defaults.

The prompt and massive response of monetary and fiscal authorities prevented an immediate liquidity crisis, which would have had profound economic and financial stability consequences. Central banks reacted swiftly to market turmoil in March by deploying a wide array of emergency liquidity facilities and new asset purchase programmes. Further lending support was also provided through the introduction of funding facilities for banks conditional on them granting new loans to the real economy. Most governments introduced measures to assuage firms’ and households’ liquidity needs, such as debt moratoriums and temporary lay-off assistance, and to facilitate their access to new financing, such as loan guarantee programmes. Bank supervisors in turn used the

*This speech was given at the 2nd Bank of Italy and Bocconi University – BAFFI CAREFIN Conference “Financial Stability and Regulation”, Rome, 22 October 2020.

*Ignazio Visco, Governor of the Bank of Italy.

flexibilities embedded in Basel III regulation and accounting standards to increase banks' headroom to absorb losses and continue financing the economy.

The policy response has been effective in achieving its short-term objectives. Markets have stabilised. Credit is flowing to firms and households, sustained to a large extent by exceptionally generous loan guarantee schemes. Economic activity is recovering. Growth forecasts have improved slightly, although there is still substantial uncertainty, driven mostly by the evolution of the global health crisis.

But, while this crisis is not over, it has already created some "legacies" of its own, which could threaten financial stability in the medium term.

First, authorities will soon have to make difficult decisions about the extension or phasing-out of some lending support measures. On the one hand, an early removal of lending support could have a destabilising cliff effect on credit supply conditions, holding back the pace of economic recovery. Even viable firms, especially those with high leverage, could face credit rationing problems. On the other hand, the extension of support measures could give rise to an undesirable allocation of credit towards unviable firms, which will eventually weigh on growth prospects. This is a dynamic trade-off. At the current juncture, where uncertainty is high and recovery still weak, downside risks from an early removal loom large and would call for a cautious extension of expiring measures. Going forward, the appropriate modulation of exit strategies must take careful account of the evolution of underlying sanitary, economic and financial developments.

Second, non-financial firms' indebtedness is expected to increase significantly, giving rise to debt overhang problems. In the wake of the first stage of the crisis, it had to be ensured that firms were able to obtain financing to cover cash shortfalls created by lockdowns. Speed in the delivery of funds to hundreds of thousands of cash-strapped small firms – as we observed in Italy – was key. In several jurisdictions this was achieved by designing policies, such as loan guarantees, that made use of the existing bank lending "infrastructure". Yet, as corporate revenue losses are unlikely to be recouped entirely, this bridge financing may lead to a permanent increase in leverage for some firms. This creates challenges in the medium term; it could lead to generalised debt overhang problems that would reduce firms' investment, weaken competitiveness and hamper economic growth.

Therefore, capital-strengthening measures by governments to reduce non-financial firms' leverage and increase their debt servicing capacity seem to be necessary. Several options have been proposed and, in some countries, already implemented, such as direct cash transfers, purchase of equity stakes or subordinated debt instruments by special purpose vehicles with public capital, and fiscal incentives to favour private equity injections into firms. The challenges are nevertheless substantial. An efficient use of public funds calls for the establishment of procedures which effectively separate, in a fast-moving environment, those firms deserving of support from the non-viable ones. This will undoubtedly be a demanding task; at the same time policy measures should be tailored to account for the differences between the governance of (often very) small firms, mostly managed by their owners, and larger firms (often joint stock companies), run by managers on behalf of shareholders. Losses from public investment in firms' equity should be minimised, if not completely fended off, while at the same time avoiding excessive and intrusive interventions in business governance and decisions.

Third, how to ensure the resilience of the banking system in the face of a likely surge in credit losses is a crucial question. Banks entered the pandemic crisis with much stronger capital and liquidity positions than before the global financial crisis, not least because of the regulatory reforms in the aftermath of the latter. As a result, there has been some room for supervisory authorities to release macroprudential buffers and to provide a flexible interpretation of microprudential requirements, with the aim of allowing banks to absorb losses and sustain the

flow of credit to all borrowers, including the most vulnerable ones; an important contribution to banks' resilience has come also from supervisors' recommendations to abstain from paying out dividends or undertaking share buybacks. As further credit losses are expected to materialise over the coming months, several banks have already started to increase their provisions substantially. A prudent approach to provisioning in the current phase is certainly desirable. Looking ahead, it is crucial that supervisors and regulators reach a difficult balance between avoiding pro-cyclical credit restrictions and maintaining safe and forward-looking risk management practices.

That said, the scale of the current crisis could nevertheless require extraordinary interventions in the banking sector. Banks have to continue to manage non-performing loans (NPLs) effectively, so that they do not build up in balance sheets, hindering efforts to strengthen capital and undermining market and consumer confidence. In Europe there is a discussion around initiatives aimed at setting up or improving the functioning of special purpose vehicles focused on the management of NPLs (asset management companies, or "bad banks"). Proposals that also include the possibility of private investors participating in the capital of these companies could be looked upon favourably. Moreover, this unprecedented shock could potentially have some banks among its victims. Unresolved issues with the crisis management framework in Europe, then, should be addressed promptly. This comprises harmonising the liquidation procedures for small and medium-sized intermediaries, including through the possibility of using common funds to conduct orderly liquidations, and finalising the creation of a backstop to the Single Resolution Fund as part of the crisis management framework.

Finally, we are left with the need to address the moral hazard, in particular on non-bank financial intermediation, created by the expectation of a "central bank put". With the outbreak of the Covid-19 pandemic, investor risk aversion has increased rapidly, leading to a surging demand for cash and to the exit from equity and fixed income markets in search of short-term, risk-free assets. Large price swings have been observed in many asset classes, volatility has increased enormously and redemptions in open-end funds have been at record high levels. Central banks have had to introduce extraordinary asset purchase programmes, special liquidity operations and US dollar funding facilities to restore market functioning and maintain the efficient transmission of monetary policy measures. These interventions have been effective, but the expectation of public intervention in the event of systemic market disruption could create moral hazard, and subsequently result in making further disruption more likely. As a consequence, progress needs to be made to introduce or reinforce the macroprudential framework for nonbank financial intermediaries (NBFIs), in particular investment funds and insurers. Macroprudential stress testing, which aims at identifying possible transmission channels and feedback effects among financial firms and markets, is still at a preliminary stage in the nonbank sector. It could represent a useful tool to assess how shocks originating in one part of the financial system can spread to other components. Further NBFi areas that need additional investigation include: minimum liquidity buffers; rules to reduce structural liquidity transformation; possible additional requirements for synthetic and traditional leverage; concentration and interconnectedness.

To conclude, the extreme macroeconomic shock triggered by the Covid-19 outbreak is testing the resilience of the global financial system and the ability of policy makers to respond to tail events, highlighting the strengths of the current regulatory framework but also some of its vulnerabilities. It is also accelerating trends that are likely to reshape the financial industry in the future. The coming months will be challenging for our societies, and the following years will see substantial structural transformations. Complex decisions with far reaching consequences will have to be taken by authorities and intermediaries all over the world. Experience in the use of existing policies is growing, but new risks are also emerging. Research and discussion fora like this conference, in which fresh ideas and experiences are exchanged among academics and

policymakers, will be ever more important. Therefore, I wish you all two very fruitful and constructive days of open discussion.

Digital Economy

CBDCs Mean Evolution, Not Revolution*

By BENOÎT CŒURÉ*

Who wants a central bank digital currency (CBDC)? Plenty of people, apparently; industry groups are advocating digital cash, millions of people have reportedly signed up to a lottery to receive digital renminbi in Shenzhen as part of the Chinese central bank's pilot project, and the Libra Association wants to "integrate" CBDCs. Technology firms, banks, NGOs and consultancies are now jostling to ride the next wave of innovation.

Earlier this year, 80% of the world's central banks had already started to conceptualize and research the potential for CBDCs, 40% were building proofs-of-concept and 10% were deploying pilot projects, according to BIS research.

Central bankers believe digital cash could be a useful addition to their toolbox, combining the safety of central bank money with electronic convenience. Safe electronic money is hardly revolutionary. For most people in advanced economies, good banking services with deposit insurance are freely available. Nonetheless, concerns have been raised that a super-safe, super-convenient new kind of money could crowd out bank deposits and starve an economy of credit in normal times, while nascent insecurities could snowball into faster-than-ever bank runs thanks to how easy it could be to move savings into digital cash.

For a start, a CBDC would ensure that, as our economies go digital, the general public would retain access to the safest form of money – held as a claim on a central bank which can never go bust. And, this will be in a form they could use freely in their daily lives.

A CBDC would be a kind of digital banknote and, as such, could satisfy more use cases than paper while the issuer, being a central bank, could support liquidity, settlement finality and trust in the value of the currency. As a result, it could promote payment diversity, help make cross-border payments faster and cheaper, foster financial inclusion and even facilitate fiscal transfers in times of crisis, such as the current COVID-19 pandemic.

Balancing these opportunities and risks is a significant practical and technical challenge. A recent report from the Bank for International Settlements (BIS) and the central banks of Canada, the euro area, Japan, Sweden, Switzerland, the United Kingdom and the United States sets out the principles and offers a guide to navigating these uncharted waters.

It also puts forward the equivalent of a monetary Hippocratic oath – pledging that any potential CBDC should "do no harm" to central banks' monetary and financial stability mandates. In fact, it goes one step further, stating that a CBDC should complement – not replace – cash and safe, private money in a new monetary ecosystem that nurtures innovation and private competition.

*Op-ed from Mr Benoit Cœuré for CoinDesk, as part of the DC Fintech Week 2020, published 20 October 2020.
*Benoit Cœuré, Head of BIS Innovation Hub.

CBDCs are more than just another way to pay. They could be the evolutionary foundation for new, publicly accessible platforms to encourage diverse ecosystems of banks and fintechs, avoiding the “winner takes all” networks we have seen emerging in our daily digital lives, and making sure innovation benefits the many, not just a few.

The exact design will vary by jurisdiction, as well as the extent to which a CBDC will seek to be a neutral means of payment or a new way to do monetary policy. Answers will vary by central bank, as will many other design choices, and will likely involve extensive consultations with the private sector and the public at large.

But if a CBDC is a matter of national taste, why (and how) should central banks work together across borders? That is where the Bank for International Settlements and its Innovation Hub come in. The BIS is owned by, and run for, more than 60 central banks around the world. We started out in 1930 but we focus on the future.

We are serious about exploring CBDCs because central banks realize that this provides an essential opportunity to pool knowledge and resources as well as build systems that complement each other and help make many cross-border payments faster, more transparent and cheaper.

The Innovation Hub is building technological capacity with its hosts to help central banks design workable solutions to emerging challenges. By the end of this year, we plan to publish our first wholesale CBDC proof-of-concept with the Swiss National Bank.

This will pave the way for experiments on the building blocks of a retail CBDC, which might include interlinkages with existing payment systems, application programming interfaces for distribution, digital identity rails, compliance monitoring, cyber and counterfeiting resilience and offline functionality. To help this, we will grow our own blockchain capacity.

This work is directed towards practical solutions rather than the conceptual research of recent years. CBDCs will not usher in an age of prosperity or solve a raft of societal issues – this is beyond the scope of any currency. They are not a revolution or an end in themselves. Yet, they might be a way of achieving a more inclusive, accessible, safe and convenient form of money. They might support a more diverse payment ecosystem, nationally and internationally and, if developed astutely, provide a new form of global public good.

Making CBDCs a True and Trusted Currency*

By WOLFRAM SEIDEMANN*

The race to issue a digital currency is on. Following the announcement of Libra (now renamed Diem) in 2019, the Covid-19 pandemic has given it fresh momentum and has reinforced the need for a ubiquitous public payment option. Nevertheless, digital currency is more than just another electronic payment method.

Currencies are the purest statement of trust that citizens make. They are not products, rather they are an expression of democratic values and faith in the issuing institution. It took centuries to establish the secure, resilient, universal and trusted basis for consumer payments that is cash. Since the outbreak of the pandemic, people have turned to cash, finding comfort in its security as a store of value and promise of freedom. More than one-third of people in the euro area keep a cash reserve at home, for example.

Cash's reputation must be kept when it becomes digital. A central bank digital currency could unite the speed and convenience of digital payments with the benefits of cash. Fundamental characteristics, such as privacy and data protection, also apply to digital cash and are necessary for public acceptance. Even though the impact on all players in the financial system must be considered, the citizen is at the centre. We should keep the properties that make people trust cash rather than letting technical discussions dominate proceedings.

Citizens' trust in physical money comes with its ease of use and openness to new business models. When talking of 'programmable' currency, digital cash should not be overengineered and keep interoperability at its core. Defined technical layers should be open to outside innovation, novel business models or entirely new ecosystems. The common denominator is the basic infrastructure – the definition and creation of a data format that represents value and is issued by a central bank.

Even with academic research papers on CBDC piling up, questions remain: What about international acceptance of digital cash? How should we define its regulatory limits? These questions will need to be answered through experience, a process of learning and steady improvement.

One thing needs to be kept in mind: We don't have centuries to make CBDCs a reality. We need to pick up the pace and set off on the right course. We don't want to sleepwalk into an unwanted future. Using longstanding experience with cash and by adding the technological opportunities we have, there is a bright future for trusted digital cash.

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Crypto Crawls from the Crypt*

By PHILIP MIDDLETON*

Just when central bankers and regulators thought that their detailed announcements about future plans for central bank digital currency had consigned them to the speculative fringes of the dark web, private cryptocurrencies are making a comeback.

The prospect of eternally low interest rates on conventional savings, suspicion that central banks' real motives in issuing CBDC have more to do with financial repression than facilitating payments, and concern that quantitative easing will destroy the value of fiat currencies, are reviving interest in instruments whose value does not reside primarily in a state's ability to levy taxes.

In recent weeks, bitcoin, having appreciated by a nominal 165% in 2020, approached an all-time high of \$20,000. Some enthusiastic commentators are predicting a high of \$318,000 by the end of 2021 and even \$600,000 by 2040. Tulips and South Sea bubbles spring inevitably to mind. Whether this is due to market manipulation by the 2% of owners who hold 95% of the coin by value, the entry of institutions into the market, or retail customers encouraged in part by Paypal's newly found enthusiasm for bitcoin as a payment instrument, is difficult to say.

Another important factor was Facebook's announcement that it would be participating in the launch of a retail digital payment instrument via the Diem Association, formerly known as Libra. Responding to much criticism from the official sector and elsewhere, Diem proposes to issue a much simplified dollar-backed stablecoin next month. Precise details are sketchy but sufficient to prompt a European Central Bank board member to declare, 'what is at stake is nothing short of the future of money.'

Within the realm of truly artificial digital currency, Robux – the in-game currency for the Roblox online computer game – achieved a reported turnover of \$1.8bn in 2020, greater than the circulation of some fiat currencies. The company behind it plans to float, although presumably will not be accepting Robux in exchange for equity.

The Covid lockdowns and the – largely misconceived – belief that banknotes and coin are transmission vectors for the virus have seen a marked reduction in the use of cash. This has also revived demand for non-fiat instruments which is also encouraged in the popular mind by a confusion about the natures of various payment instruments.

The distinction often fails to be made between true cryptos (a private sector instrument, usually but not necessarily digital, with no guaranteed convertibility into fiat money); stablecoins (a private sector digital token backed by and theoretically convertible into a real asset); private bank money (bank debit card, also known as M1); and CBDC or digital cash with recourse to the central bank (M0). It can be confusing even for specialists.

Unless there is clear public education about the characteristics of these instruments, accompanied by appropriate regulation, central banks will have an uphill struggle to introduce CBDC, and to convince citizens to ignore the siren calls of cryptos.

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China's Winning CBDC Approach*

By GARY SMITH*

Will China's central bank digital currency experiment be a success? Offering 50,000 Shenzhen citizens a wallet containing around \$30 in a lottery has created momentum. Banning the prospect of any other form of digital money and adopting a rigorous approach to encouraging retailer acceptance has been helpful. The citizens of Shenzhen were ready for CBDC – 2m applied to participate.

The architecture of money is changing. The pandemic has led to a collapse in the use of cash around the globe. A desire to avoid touching notes and coins has combined with the expanded availability of cashless payment options in shops and a surge in online shopping.

Central banks everywhere have been jolted into action. It seems inevitable that the squeeze on cash will trigger multiple CBDC initiatives. Many will share some of the technological characteristics of cryptocurrencies like bitcoin, but will differ in three important ways. First, CBDC will probably exist on a centralised platform, and therefore will be subject to government oversight. Second, it will be denominated in the local fiat currency at a constant value. Third, CBDC and domestic cash will be interchangeable.

In the euro area, cash transactions account for around 10% of GDP. In the UK and US it is around 5%. In Sweden, which has been described as sleepwalking to a cashless society, it is less than 1%. The Swedish central bank has reacted by launching a CBDC trial, stating openly the need to preserve a role for cash. The Riksbank has stressed that cash remains the anchor for the economic system, and could be usefully complemented by CBDC.

Nowhere is resistance to CBDC greater than in the US, and that is in part because the commercial banking lobby is strong. Commercial banks are concerned that their role as deposit takers could be undermined by a CBDC that would be 'gilt edged'. This would weaken their role in the money creation process. Federal Reserve Governor Jerome Powell has defended the slow pace on CBDC by arguing that the US payments system works effectively.

China does not have private sector banks. All have some degree of state ownership, so there is no comparable lobby pressure. Most Chinese consumers have never known banking that was not via a mobile device, and already have limited expectations of privacy. In short, as evidence from the lottery scheme in Shenzhen suggests, China is an ideal testing ground for CBDC.

Four state-owned banks will distribute the digital renminbi, known as the digital currency electronic payment. They will therefore be integral to its existence. There are concerns about commercial banks being disintermediated, but there are suggestions that the People's Bank of China could re-lend DCEP deposits to the commercial banks. This would give the central bank even more oversight (and perhaps control) over the use of DCEP in the Chinese economy.

The fact that the Shenzhen lottery wins could be cancelled if not spent highlights that CBDC could be a useful monetary policy tool. Crisis support payments could be targeted at those citizens in most need, with immediate effect, rather than written on cheques and mailed to citizens (some of whom were dead) as was the case in the US earlier this year.

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The international monetary system is prone to sudden change after very long periods of stability. A digital currency revolution might become a threat to the role of the dollar, in a similar way that the second world war shunted sterling out of its role as the world's primary reserve currency.

The Chinese media is always keen to talk up the potential for the renminbi to rise, and the digital currency experiment has given them an opportunity to do exactly that. Longer-term, the Belt and Road initiative will provide the means for an expanded use of digital renminbi for making international payments, and in particular, remittances. At the moment, the dollar dominates BRI trade and remittance flows. Beijing will be happy to see the renminbi have an expanded role.

There is no doubt that the US is at the back of the pack in terms of the CBDC revolution. But it is home to the world's most powerful and innovative tech firms. It is well placed to catch up with China via a public-private partnership if the political will can be marshalled.

China has secured a first mover advantage, but how decisive this will be in boosting the internationalisation of the renminbi will be played out over years, not months.

Monetary Thinking and Regulatory Tinkering*

By RYAN PETERSON*

Monetary, regulatory, and macroprudential policies have traditionally been the main focus of central banks and financial regulators. Nonetheless, continued advancements in financial technologies and digital transformation are leading to new monetary thinking and regulatory tinkering by central banks.

They seek to maintain monetary and financial stability, especially in a post-pandemic world. Small island economies in particular face intensifying challenges in navigating a combination of fiscal, economic, and socioecological shocks.

Associated with the acceleration in digital transformations are not only new (distributed) technologies and (shared) institutional mechanisms, but more importantly, the transformation and evolution of certain values, norms, and beliefs about the nature of money and trust. Beyond money and markets, codifying trust is crucial at this point in the evolution of financial services.

Increasingly, monetary authorities and regulators are exploring and experimenting with the adoption of distributed ledger technologies, digital currencies, artificial intelligence, augmented reality and a host of other digital technologies.

From an evolutionary ecology perspective, what we are witnessing is a form of speciation or ‘polymerisation’, a process where small nascent variations, such as experimental digital currencies, could accumulate into systemic changes. This includes, for instance, distributed financial technology ecosystems, which could result in the emergence of novel hybrid species, such as a central bank digital currency.

As architects of the future, nimble regulators are likely to take the lead, as witnessed by numerous recent accounts of monetary innovation and experimentation by central banks. Following the law of requisite variety, regulatory resilience in volatile and uncertain environments requires a range of monetary and regulatory instruments, and thus, a capacity for regulatory innovation.

The advancements in, for instance, the variety of digital currencies, financial technology charters, regulatory sandboxes, blockchain collaborations and experimentation with CBDC are clear and present signs of evolution.

Several central banks in the Caribbean are already piloting their respective digital currencies. New digital payment networks are being developed across small island economies. If small island economies wish to maintain stability in the face of volatility, uncertainty, complexity and ambiguity, further exacerbated by the devastating financial consequences of the Covid-19 pandemic, their respective monetary and financial authorities should be able to generate at least as many strategies as there are dynamics.

Leaning into the future and leading with foresight will require digital thinking and tinkering.

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Sustainable Development

The Sino-American Race to Zero^{*}

By ANDREW SHENG AND XIAO GENG^{*}

If China and the US – the world’s two largest emitters of carbon dioxide emitters – reach net-zero emissions by mid-century, everyone will be better off. A strategy of constructive competition, rather than a cutthroat race, will get both countries to the finish line much faster.

As the United States prepares for a radical course-correction on climate change, China is raising its game. Climate action has become yet another front in the competition between the world’s two largest economies. Who will cross the net-zero-emissions finish line first?

US President-elect Joe Biden is prepared to hit the ground running. He has pledged to rejoin the Paris climate agreement on his first day in office, and vowed to put emissions-reduction efforts and clean-energy jobs at the center of his administration’s economic policymaking, with the goal of reaching net-zero emissions no later than 2050. To spearhead progress, he has created a new White House Office of Climate Policy, and appointed a team of experienced professionals to key posts. Former Secretary of State John Kerry for example, will serve as an international envoy on climate change.

Likewise, Chinese President Xi Jinping has pledged to achieve carbon neutrality by 2060. In addition, at the recent Climate Ambition Summit, he vowed to reduce China’s carbon-dioxide emissions by “at least” 65% from 2005 levels by 2030, an increase from his previously established target of “up to” 65%.

The economic costs of achieving these goals would not be exorbitant. The Energy Transitions Commission estimates that China can achieve a zero-carbon economy by 2050 at a cost of less than 0.6% of GDP. The US could succeed at a cost of just 0.4% of GDP, according to the Sustainable Development Solutions Network (SDSN).

But even if the US and China are headed toward the same finish line, they are likely to take quite different paths. For example, given its extensive experience with re-forestation, China will likely focus more on natural sequestration of carbon than the US will. Already, its leaders have promised to increase its forest coverage by six billion cubic square meters over the next decade.

Moreover, China has already planned its route in much greater detail than the US has. The country’s leaders have embedded climate objectives in their broader economic-development blueprint – including the Made in China 2025 industrial strategy – which also includes technological and industrial goals.

Chinese economic planners view the carbon-neutrality vision as a foundation for the shift to high-quality growth and development. In line with this approach, Energy Foundation China

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recently published a report examining pathways to fulfill the carbon-neutrality pledge and achieve the government's vision for economic growth and development.

If the US is to achieve carbon neutrality by mid-century, the Biden administration will have to take a similarly holistic approach, which also covers job creation and technological innovation. While Biden seems to recognize this, he will, in many ways, be starting from scratch. Over the last four years, President Donald Trump has not only failed to take climate action; he has actively undermined it, such as by rolling back environmental regulations.

The good news is that Biden has a framework to help his administration succeed: the SDSN's Zero Carbon Action Plan. Much like the Chinese strategy, the ZCAP focuses on six major energy-intensive sectors – power generation, transportation, buildings, industry, land use, and materials – which contribute significantly to carbon emissions and natural-resource degradation.

Unlike China, however, the US has a federal structure and a democratic political system. Given this, executing a strategy like the ZCAP will require not only strong federal leadership (and considerable funding), but also cooperation with state and local governments, private-sector participation, and broad public buy-in.

Moreover, to implement bold reforms, the Biden administration will have to overcome resistance from Republicans, who both oppose strong climate action and balk at the idea of industrial policy for ideological reasons. Legal challenges by powerful vested interests are also a possibility.

This is not to say that China's economic policymaking is purely a top-down affair. On the contrary, China owes its economic success to local-level experimentation, constant adaptation to changing conditions, and the broad application of proven approaches.

Furthermore, despite China's autocratic reputation, its policymaking processes include feedback mechanisms that enable leaders to respond to the public's needs. For example, in the runup to the annual Central Economic Work Conference, where China's leaders establish policies and targets for the subsequent year, working groups consult local officials to gain a clear understanding of conditions on the ground, and solicit opinions from external experts, such as at the World Bank.

Markets provide another important feedback mechanism. Contrary to popular belief outside China, markets play a significant – and expanding – role in allocating resources, creating jobs, coordinating supply and demand, and spurring innovation. China's fast-growing middle class, in particular, is demanding better environmental conditions, rather than just GDP growth.

Overall, however, China's centralized governance system puts its leaders in a better position than the US to implement bold reforms and engage in comprehensive long-term planning. China is more likely to struggle to comprehend the scale, scope, and costs of energy-intensive economic activities, especially compared to the life-cycle costs of green energy, materials, transportation systems, industrial and agricultural technologies, and land-use approaches.

This is where “constructive competition” with the US can help, potentially in the form of “targeted reciprocity.” As former US Treasury Secretary Henry Paulson recently argued, rather than demand reciprocity on “anything and everything China does,” the US should “aim its demands for reciprocity at sectors and areas where America is the strongest,” at its “most competitive,” and has “maximum leverage.” This could mean sharing knowledge about green technologies, in exchange for greater transparency and higher shared standards.

There are few policy areas where progress in one or two countries will leave every person on the planet better off. But, if China and the US – the world's two largest emitters of carbon dioxide – reach net-zero by mid-century, that is what will happen. A strategy of constructive competition, rather than a cutthroat race, will get both countries to the finish line much faster.

Climate Risk Analysis Tools Are Public Goods*

By MA JUN*

Positive progress has been made in green finance globally despite the Covid-19 pandemic. One notable example is the growing consensus among central banks and regulators that enhanced environmental risk analysis is essential to greening global investments and protecting the financial system.

Environmental risk factors, such as rising sea levels, floods and other natural disasters, as well as transition shocks, threaten the financial industry and financial stability. As governments take action to reduce emissions and as progress is made in green technologies, exposure to polluting assets is higher risk. Institutional investors could see their assets devalued.

However, environmental factors have not been sufficiently factored into decision-making due to a number of barriers. These include a lack of data and methodology to conduct environmental risk analysis, and inadequate capacities to apply ERA in emerging markets.

Against this backdrop, the Central Banks and Supervisors Network for Greening the Financial System published its overview of environmental risk analysis by financial institutions on 10 September.

The ERA overview, and the accompanying NGFS occasional paper, ‘Case studies of environmental risk analysis methodologies’, provide reference tools and methods for financial institutions to measure their exposures to climate risks and quantify the financial risks arising from these exposures.

The overview gives a non-technical review of ERA tools and methodologies used by banks, asset managers and insurance companies.

It discusses the barriers to promoting ERA and options to address these. This covers increasing awareness among financial institutions, carrying out capacity-building activities on ERA tools and methodologies, supporting pilot projects, and promoting disclosures of ERA results.

The case studies introduce the ERA methodologies, models and applications developed by more than 30 leading institutions around the world. The 600-page report is the most comprehensive document on ERA to date.

Basic research frameworks and commonly used ERA methodologies should be public goods. A lot of effort may be duplicated and resources wasted if each financial institution has to invest individually in developing these methodologies. The overview and case studies provide such a public good for the members of the financial community seeking to enhance their capacities and further develop ERA methodologies.

All parties in the financial sector should work together to promote the wider adoption of ERA. Enhancing environmental governance in the financial sector would help prevent the threat to financial stability from environmental risks.

Financial resources would be more effectively steered towards green and low-carbon sectors, supporting a green recovery and the sustainable development of the global economy.

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Working Paper

Does Regional Currency Matter for Regional Trade Integration?

--The Implication for RMB*

By HE QING, ZHANG CE AND ZHU WENYU*

Abstract: *This paper examines the choice of the most frequently used regional currency and discovers a U-shaped relationship between the degree of currency integration and the level of regional trade integration. When the proportion of the most frequently used regional currency is low, its use impedes regional trade. However, upon exceeding a threshold, the prevalence of a dominant regional currency promotes regional trade. This U-shaped relationship can be explained by both transaction cost and political factors. Finally, we provide policy application for “The Belt and Road Initiative” and point out that policy coordination is important to improve RMB internationalization.*

Keywords: currency; trade integration; international monetary cooperation

1 Introduction

Regional globalization and regional trade agreements quickly become the new trend in the world. As the development of regional trade integration, many scholars are seeking determinants of international regional trade integration. According to Feenstra (1998), trade liberalization and similar economies account for regional trade integration. Baier and Bergstrand (2004) build a model and discover that difference in capital-labor endowment ratios increases the probability of a free trade agreement (FTA). Besides, Martin et al. (2008) emphasize the relationship between military conflicts and regional trade. But until now, no one has analyzed what currency contributes to regional trade from the perspective of regional trade rather than trade between two countries. However, whether it is regional trade or global trade, there will be a big problem in choosing invoicing currency and settlement currency. Transaction cost of currency is considered as the chief factor (Krugman, 1980; Rey, 2001). So currency is still a major issue in regional trade.

As technology diffuses rapidly, lower transportation costs and instant communication reduce economic barriers among different countries. Distance is no longer the most important determinant in international trade, and globalization has become the prominent feature of the world economy now. But today is not the only golden age of international regional trade integration. Also with the strengthening of world multi-polarization, conflicts in traditional multilateral trade systems, which

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directly accelerate the development of international regional trade integration, have become apparent and sharp. As of 8 January 2015, 604 notifications of regional trade agreements (RTAs) have been received by the General Agreement on Tariffs and Trade/World Trade Organization (GATT/WTO). A growing number of RTAs reflects closer trade relationship in the world and greater regional trade integration.

Existing literature on currency and trade integration typically employs the gravity model to explain the impact of currency unions on bilateral trade (Rose, 2000). However, a limitation of this approach is that the currency union dummy is a very restrictive measure of regional currency integration. Even if the region does not use a common currency, a particular local currency may be more important in regional transactions than other international currencies. This weak form of regional currency integration can also promote regional trade by lowering regional transaction costs. Moreover, conventional studies on the effects of currency unions on bilateral trade are silent on the costs and benefits of currency integration during the transitional process. For example, the Chinese government is promoting RMB as an invoicing currency for trade in the "The Belt and Road Initiative" region in order to encourage economic integration with its trading partners in this region. However, whether the use of RMB can promote regional trade is uncertain. For these reasons, we adopt a different approach to explain the relationship between the degree of regional currency integration and regional trade integration. Our empirical results suggest that regional trade integration initially declines with currency integration due to a higher transaction cost and political factors associated with the expansion of the use of a specific local currency. Once a local currency dominates the invoicing choice in the region, the transaction cost will be reduced. In addition, some countries as coordinators will avoid deploying beggar-thy-neighbour monetary policy, all of which promotes trade in the region. An important application for our theory is "The Belt and Road". We give the simulation results for the RMB proportion for "The Belt and Road" countries and there is high potential for RMB to be the regional currency. Capital account liberalization and policy coordination is important for RMB internationalization and contribute a lot to the regional trade.

The remainder of this paper proceeds as follows: Section 2 reviews the literature and develops our hypothesis. Section 3 introduces the variables and describes the summary statistics, Section 4 shows our empirical model and results and states our explanation, Section 5 develops a policy application for the "The Belt and Road Initiative" and analyses the reason why there is a difference between reality and simulation. Section 6 concludes the paper.

2 Literature Review and Hypothesis Development

Since the 1990s, with the strengthening of world multi-polarization and increasingly obvious contradictions under traditional multilateral trade systems, regional trade integration has quickly become a trend in the world. The elimination of trade barriers and booming number of regional trade agreements would entail a huge shift in global trade patterns. In addition to the literature we mentioned above, the World Bank (2009) analyses the reasons for the boom of regional trade agreements and finds that the reduction of artificial spatial barriers usually occurs between close trading partners, both in the sense of geographical proximity and large bilateral trading volume. As a direct result, it is easier to have lower tariffs and higher quotas. This will in turn make closer trading partners become even closer and facilitate the gain of trade preferences in the future. Regional trade agreements only provide a more convenient trade environment to those who already have large bilateral trade volume. Feenstra (1998) uses the level of merchandise trade relative to GDP to describe the level of global integration and finds it reached a peak in 1913 and rose again in the late 1960s. He also points out that similarity is the key factor in trade integration. However, these studies ignore the role of transaction currency.

Despite the difficulty in measuring the effect of currency in regional trade, the view that currency or international monetary cooperation has a substantial positive impact on trade has been demonstrated in previous empirical studies. Helliwell (1996) finds that trade between two Canadian provinces is more than twenty times larger than trade between a comparable Canadian province/American state pair mainly because trade occurs inside Canada using a single currency, while two currencies are necessary for economic transactions between Canada and America. Rose (2000) finds that trade between two countries using the same currency is triple of that using different currencies. An important reason is that currency integration lowers transaction costs. High transaction cost impedes trade, while low transaction cost promotes trade (Krugman, 1980).

In previous studies, scholars usually focus on single currency and currency union to explain the relationship between currency and bilateral trade. However, both single currency and currency union are conditions which are too hard to meet. Much of monetary cooperation, which does not relate to single currency or establishing a currency union, also contributes to a boost to trade. Single currency in a region means some countries have to give up their monetary sovereignty. Lacking an independent monetary policy makes it more difficult to balance payments and causes the economy to become more dependent on the currency issuing country. Establishing a currency union, like the Eurozone, might also lead to problems, such as coordination failures in fiscal discipline. An optimum currency area sets strict requirements on regional trade, economic development, inflation and financial systems. In this paper, we discuss regional monetary integration in a more general way and use the proportion of the most frequently used regional currency to measure the progress of international monetary cooperation. For a currency union, the most frequently used regional currency is the common currency. But other regions also have a dominating currency which is used most frequently, so this concept measures international monetary cooperation in a more general way. Moreover, this concept emphasizes that a dominating currency is a local currency, whose issuing country is in the region. As countries in the same region usually have close relationship in economy and trade, only a regional currency can effectively protect against assault of international capital. After the US subprime mortgage crisis, more and more countries are realizing that the regional currency is the best choice to protect against assault of international capital (Goldberg & Tille, 2008).

Previous empirical work (e.g. Rose, 2000) finds that a currency union has positive effect on bilateral trade. We think the most frequently used regional currency also has positive effect on regional trade and on the promotion of regional trade integration. We also consider the inertia in choosing currency for invoicing or settlement (Rey, 2001). The expansion of regional currency may face many obstacles and might impede regional trade at the beginning because other currencies (like US dollar for many regions) constitute a large proportion in currency usage, and their transaction costs are lower. However, along with the increase in proportion, the regional currency will eventually have lower transaction cost and can serve the region better than other currencies. Hence, we expect that there is a U-shaped relationship between regional trade integration and the most frequently used regional currency. When the proportion of the most frequently used regional currency is low, using this currency has a negative impact on regional trade. Once it exceeds a certain threshold, it promotes regional trade.

3 Descriptive Statistics of Variables and the Model

3.1 Variable Definition

The most important variable in this paper is the proportion of the most frequently used regional currency. We use the data on foreign exchange transactions to calculate it. The Bank for International Settlements publishes Triennial Central Bank Survey of Foreign Exchange and Derivatives Market Activity, which covers the foreign exchange transactions of different

currencies in different countries. The most frequently used regional currency is defined as the largest foreign exchange transaction currency whose issuing country is in the region. The proportion of the foreign exchange transactions of the most frequently used regional currency to the total transactions is then calculated. We choose samples after 2001, because the euro appeared in 2001.

Intraregional trade share is the proportion of regional import and export volume to the total import and export volume, which directly describes the independence and importance. We use the intraregional trade share to define trade integration.

Intraregional trade share is defined as

$$IT\ Share_i = (EX_{ii} + IM_{ii}) / (EM_i + IM_i)$$

, where EX_{ii} and IM_{ii} are the regional export and import volumes of region i in region i ; EM_i and IM_i are the total export and import volumes of region i .

Due to the fact that data on Africa and Central America are not available, our sample cannot cover the regional economic cooperation organizations in Africa and Central America. We choose 16 in this paper, including all types of regional economic cooperation organizations at the national level. They are Benelux Economic Union (Benelux), European Union (EU), European Free Trade Association (EFTA), Commonwealth of Independent States (CIS), Eurasian Economic Community (EAEC), Association of Southeast Asian Nations plus China, Japan and Korea (ASEAN+3), Economic Cooperation Organization (ECO), First Agreement on Trade Negotiations among Developing Member Countries of the Economic and Social Commission for Asia and the Pacific (Bangkok Agreement), South Asian Association for Regional Cooperation (SAARC), Pacific Islands Forum (PIF), Gulf Cooperation Council (GCC), Andean Community (CAN), G3 Free Trade Agreement (G3), North American Free Trade Area (NAFTA), MERCOSUR and Asia-Pacific Economic Cooperation (APEC).

Table 1 provides the definitions of the variables used in the model. Export and import data are obtained from the IMF Direction of Trade Statistics and the CEIC Global Database, and the rest of the data are extracted from the World Bank's World Development Indicators.

Table 1. Variable Definition

Variable	Definition and measurement
<i>Trade integration</i>	Intraregional trade share
<i>Currency</i>	The proportion of the most frequently used regional currency
<i>Currency2</i>	The quadratic term of the proportion of the most frequently used regional currency
<i>Dgdp</i>	The GDP of the country issuing the most frequently used regional currency as a share of total GDP of the region
<i>Trade openness</i>	Trade openness in the region (average)
<i>Metrade</i>	Merchandise trade (% of the GDP) in the region (standard deviation)
<i>GDPpc</i>	GDP per capita in the region (standard deviation)

3.2 Descriptive Statistics of Variables

Table 2 shows the descriptive statistics of major variables. The proportion of the most frequently used regional currency ranges from 0.18 to 0.96 in different regions. The big gap is mainly because US dollar as an international currency usually occupies a large proportion in the region, nearly 100%. As for the intraregional trade share, there are also differences among these regions, which means the level of trade integration is different though they are all economic cooperation organizations. Besides, in some of the regions, countries inside the region differ greatly in

industrial structure, trade structure and economic development level, while some are nearly the same.

Table 2 Descriptive Statistics

Variable	Mean	Std. Dev	Min	Max
Trade integration	0.1987	0.2107	0.0064	0.7206
Currency	0.5842	0.2140	0.1786	0.9633
Currency2	0.3881	0.2522	0.0319	0.9279
Dgdp	0.6609	0.2161	0.1033	1
Trade openness	0.8690	0.3763	0.375	2.213
Metrade	0.2970	0.2107	0.0537	0.9273
GDPpc	11.77	10.57	0.6221	42.82

Table 3 presents some data on the proportion of the most frequently used regional currency and intraregional trade share in 2001 and 2013 of all the regional economic cooperation organizations mentioned in this paper. During these 12 years, the most frequently used regional currency remains the same, but the proportion has changed greatly. As for trade integration, the intraregional trade share changes comparatively smaller than the proportion of the most frequently used regional currency.

Table 3 Major Variables in 2001 and 2003 of All Regions

Region	The most frequently used regional currency	Year	The proportion of the most frequently used regional currency	Intraregional trade share
Benelux	Euro	2001	0.6818	0.1374
		2013	0.5281	0.1537
EU	Euro	2001	0.4871	0.6606
		2013	0.4175	0.6353
EFTA	Swiss Franc	2001	0.2915	0.0074
		2013	0.2689	0.0082
CIS	Russian Ruble	2001	0.4336	0.1859
		2013	0.7927	0.1881
EAEC	Russian Ruble	2001	0.4336	0.1005
		2013	0.7927	0.1195
ASEAN“10+3”	Yen	2001	0.5174	0.3406
		2013	0.4418	0.3519
ECO	Turkish Lira	2001	0.2735	0.0451
		2013	0.5754	0.0846
Bangkok Agreement	Korean Won	2001	0.6467	0.0934
		2013	0.3246	0.1189
SAARC	Indian Rupee	2001	0.8206	0.0408
		2013	0.8199	0.0398
PIF	Australian Dollar	2001	0.4578	0.0675
		2013	0.4408	0.0480
GCC	Saudi Riyal	2001	0.2079	0.0649
		2013	0.1795	0.0530

CAN	Colombian Peso	2001	0.5953	0.0889
		2013	0.5644	0.0772
G3	Mexico Peso	2001	0.9542	0.0221
		2013	0.8771	0.0219
NAFTA	US Dollar	2001	0.9382	0.4710
		2013	0.8907	0.4131
MERCOSUR	Brazilian Real	2001	0.9633	0.1885
		2013	0.6829	0.1478
APEC	US Dollar	2001	0.9421	0.7128
		2013	0.8927	0.6640

3.3 The Model

To study the determinants of regional trade integration, the following panel regression model is estimated:

$$Trade\ integration_{it} = \beta_0 + \beta_1 Currency_{it} + \beta_2 Currency2_{it} + \beta_3 Controls + \lambda_i + u_t + \varepsilon_{it}$$

where

Trade integration is our measure of trade integration. We use the intraregional trade share to measure the development of regional trade. The variable is the ratio of intraregional import and export volumes to the total import and export volumes of countries in the region;

Currency represents the proportion of the most frequently used regional currency. It is defined as the ratio of foreign exchange transactions of the most frequently used regional currency to total foreign exchange transactions;

Currency2 is the quadratic term of *Currency*;

Controls is a vector of control variables, which includes the GDP of the country issuing the commonly used regional currency as a share of the total GDP of the region, trade openness and two indicators of similarities in economic structures between countries in the region.

i represents the region, while *t* represents the year;

λ_i is the unobservable regional factor;

u_t is the unobservable time-varying common factor across regions;

ε_{it} is the random disturbance term.

We use the total GDP of those countries, which are issuing the most frequently used regional currency measured to the total GDP in the region as one of the control variables, to control the different status of the regional currency in different regions. Goldberg & Tille (2008) show the economic size of the issuing country contributes immensely to the currency share of invoicing. So it also controls the potential of the regional currency. Ho (2011) uses the GDP share rather than trade share because GDP share is more comprehensive and reasonable in these times. Due to the increasingly globalised world, big nation states would not be self-sufficient but need to trade more with the other nation states. So GDP share has fewer disadvantages and further it can not only show the effect of bilateral trade, but also reflect the promoting on trade through third party states.

Trade openness is another control variable. On the one hand, high trade openness could mean the country is positively involved in the world trade and regional trade may be closer. On the other hand, high trade openness could increase bilateral conflicts or multilateral conflicts, which impede the regional trade (Martin et al., 2008). The discussion of trade openness measurement is beyond the scope of this paper. We chose the trade volume of both export and import relative to GDP as the proxy variable for the trade openness, as it is widely accepted by other scholars (Bonfiglioli, 2008).

Feenstra (1998) find similar economic structures lead to high level of trade integration. In this paper, we chose merchandise trade (% of the GDP) and GDP per capita to measure the similar economic structures. These three variables reflect the trade structure, economic development level and society development level. All the variables are calculated by the standard deviation in the region to measure the difference of the region. It can be compared across regions and over time.

4 Empirical Results

Table 4 reports the regression results. The dependent variable is the intraregional trade share. Models in Column (1) and Column (3) only show the proportion of the most frequently used regional currency and its quadratic term, while control variables are added in the models summarized in Column (2) and Column (4). All models include regional fixed effects. Models in Columns (1) and (2) do not consider time fixed effects, while models in Columns (3) and (4) control for time fixed effects. Column (5) instruments *Currency*, *Currency2*, and *Trade openness* by their one-period lags. Column (6) further instruments *Dgdp* by its one-period lag. Column (7) instruments all variables by their one-period lags.

Table 4. Empirical Results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
<i>Currency</i>	-0.280*** (0.065)	-0.284*** (0.065)	-0.209*** (0.073)	-0.196** (0.081)	-0.279** (0.138)	-0.275** (0.138)	-0.280** (0.138)
<i>Currency2</i>	0.222*** (0.053)	0.220*** (0.054)	0.167*** (0.061)	0.150** (0.068)	0.217* (0.116)	0.215* (0.116)	0.222* (0.116)
<i>Dgdp</i>		-0.024 (0.025)		-0.049* (0.027)	-0.018 (0.028)	-0.017 (0.028)	-0.018 (0.028)
<i>Tradeopenness</i>		0.079*** (0.021)		0.081*** (0.023)	0.078*** (0.024)	0.078*** (0.024)	0.079*** (0.024)
<i>Metrade</i>		-0.114*** (0.030)		-0.109*** (0.031)	-0.100*** (0.035)	-0.100*** (0.035)	-0.101*** (0.035)
<i>GDPpc</i>		-0.001*** (0.000)		-0.000 (0.000)	-0.001*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)
R-squared	0.091	0.216	0.175	0.275	0.223	0.222	0.218
IV quality					24.532	18.286	12.588
Sargan					0.689	0.230	0.109
Threshold	0.6306	0.6455	0.6257	0.6533	0.6429	0.6395	0.6306

Note: Standard errors are in parentheses*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. IV quality reports the Cragg-Donald Wald F statistic. Sargan reports the p value of the over-identification test.

Notice that there is a significant U-shaped relationship between regional trade integration and the proportion of the most frequently used regional currency across all model specifications. The estimated coefficients of both *Currency* and *Currency2* are statistically significant across all specifications. The U-shaped relationship suggests that when the proportion of the most frequently used regional currency is low, an increase of the proportion may impede regional trade development. However, after reaching a threshold of around 60%, a further increase in the proportion of the most frequently used regional currency promotes regional trade integration. Such a relationship can be explained by the transaction cost of using a common currency. After the breakdown of the Bretton Woods system, only a few countries chose to adopt a floating exchange rate regime, and many countries still regard the USD as an anchor currency. In the late 20th century,

some countries in Africa and Latin America instituted dollarization to stabilize their domestic markets, enhance international trade and save the trouble of establishing foreign reserves. Using the USD directly for trade invoicing and settlement can avoid exchange rate risk and reduce transaction costs. When a regional currency has not reached a dominating status, the transaction cost of using such a currency will be higher than using the USD. Thus, the use of regional currency may impede regional trade initially. However, as the regional currency becomes dominant, the use of this currency can reduce transaction costs and accelerate the economic development in the region. The huge trade-promoting effect of a currency union found by Rose (2000) supports our findings. By using a single currency for transactions, a currency union can quickly eliminate the negative effect on trade development.

Although it is costless to use US dollar during trade, you need to pay back the lower transaction cost ultimately. First of all, it makes the countries in the region rely more on the US economy if US dollar is used very often in the region. And once there is something amiss in the US economy, its business cycle and monetary policy will deeply affect the countries in the region. Many countries are in a stage of rapid economic development before the US subprime mortgage crisis, but they are also unwillingly influenced by this crisis due to being overly dependent on US dollar. So, reforming the existing monetary system structure in the region and even in the world as well as reducing the dependence on a sovereign currency have become the consensus of the market. Second, if the country carries out dollarization, there is no independence in monetary policy and exchange rate policy. The US will not consider dollarized countries when setting policies. Also dollarized countries cannot use monetary policy and exchange rate policy to finance budget deficits and balance the payments. However, without dollarization, there is a big problem in invoicing and settlement because the US dollar exchange rate fluctuation brings much instability. In addition, one of the purposes of regional economic cooperation is to make up for the disadvantages of a single country, amplify the voices of individual countries in the world and jointly maintain the common interests of the region (Krugman, 1991). Using a regional currency can effectively enhance the economic ties among the countries in the region and make the region more competitive in the world market.

The cost and benefit of a currency union changes according to the environment (Artis, 2002), and the cost and benefit of a regional currency is changeable too. With the low transaction cost, US dollar provided a “safe haven” for world development before 2008. But as the US subprime mortgage crisis spreads all over the world, more and more countries realize using regional currency is important in trade development and economic independence. At first, the transaction cost may be relatively high because of the lower proportion. But as the proportion of the most frequently used regional currency increases, this currency can also reduce the transaction cost and better serve the economic development in the region. The same currency and the currency union discussed in the previous paper can also be explained by our theory (Rose, 2000; Rey, 2001). Whether it is the same currency or the currency union, the direct trade-promoting effect exists because it can quickly pass the bottom of the “U-shape”. Compared to the process of increasing the proportion of regional currency used, the same currency and the currency union have higher institutional cost and impair the strength of monetary policy tools, which may lead to economic upheaval and unbalanced payments. It is also the reason why the same currency and the currency union are hard to propagate.

Reconsider this problem from a political point of view, when the proportion of the most frequently used regional currency is low, many local currencies compete to be the regional currency. Some countries in the region may formulate policy which has negative externalities, and many negotiations and consultations ensue to alleviate the policy impact. And all of these are for the competition for the regional currency. It may be considered irrational from the economic view,

but it is true, and ignoring political factors may lead to wrong policy (Kirshner, 2003). So, these policy shocks and political games definitely impede trade, and it is one reason why regional currency does harm to trade at first. When the most frequently used regional currency rises to an invincible position, the issuing country acts as a monetary leader of the region that contributes a lot to cooperation and coordination among countries, preventing beggar-thy-neighbour monetary policies and promoting regional trade integration. In addition, once the issuing country has an invincible position, it tends to sacrifice some its own interests to maintain regional interests (Kirshner, 1997). This means the region will have higher trade integration, more stable financial markets and more rapid economic development when the proportion of the most frequently used currency is high.

5 Policy Implications for RMB

Previous results employ the proportion of the most frequently used regional currency to show the U-shape relationship between currency and regional trade. In this section, we discuss its policy implications for regional economic cooperation among the countries along “The Belt and Road”. China puts forward the concept of “The Belt and Road” in 2015, and the first Belt and Road Forum for International Cooperation was held on 14 May 2017. Whether RMB can play a core role in the “The Belt and Road Initiative” and raise the status of RMB is worth discussing. Following Chinn and Frankel (2005), we develop a regression model and use nine variables to fit the variable *Currency*: issuing country’s GDP share, country risk, credit to the private sector, FDI, foreign reserves, trade openness, manufacture export volume, GDP per capita and life expectancy. Multivariate regression gives us the linear prediction of the most frequently used regional currency. Substituting the data into the regression, we can get the fitted values of *Currency* variable for the “The Belt and Road” area.

Table 5 reports the results of selected countries. In all country groups, the proportion of using RMB is more than 40%, and it is undoubtedly the most frequently used regional currency. It shows that RMB has considerable potential for acting as a regional currency and serving regional trade integration. Other currencies, such as rouble, rupee and Singapore dollar, are competitive but will not change the RMB’s status. Whether RMB can take the first place and avoid monetary competition, China needs more international policy coordination and raises the proportion up to 60%. According to our simulation, the proportion of using RMB occupies 75.30% in Central Asian countries. In the simulation of Maritime Silk Route, RMB’s proportion is as high as 46.66%.

Table 5. Simulation Results

	RMB	Rouble	Rupee	other
Country Group 1	60.74%	16.42%		
Country Group 2	56.18%	17.31%	13.59%	
Country Group 3	65.15%	27.72%		
Country Group 4	51.79%		8.29%	
Country Group 5	46.66%		11.17%	9.77%(Singapore Dollar); 5.26%(Indonesian Rupiah)

Note: Country Group 1: Russia, Turkmenistan, Kazakhstan, Kyrgyzstan, Tajikistan, Uzbekistan; Country Group 2: Russia, India, Pakistan, Afghanistan, Turkmenistan, Kazakhstan, Kyrgyzstan, Tajikistan, Uzbekistan; Country Group 3: Russia, Ukraine, Turkey, Turkmenistan, Kazakhstan, Kyrgyzstan, Tajikistan, Uzbekistan, Mongolia, Belarus, Azerbaijan, Armenia, Georgia; Country Group 4: India, Saudi Arabia, Iran, Turkey, Iraq, Jordan, Kuwait, Afghanistan; Country Group 5:

Indonesia, the Philippines, Malaysia, Vietnam, Laos, Myanmar, Thailand, India, Singapore, Bangladesh.

Simulation is not the reality, and we next turn to the existing trade agreements in which China participates: Asia-Pacific Economic Cooperation, ASEAN “10+3” and Shanghai Cooperation Organization. Table 6 provides the results, and we find that there is a big difference between simulation and reality. This phenomenon reflects the lag effect of currency used compared to economic development, and RMB internationalization is still at its beginning. On the other hand, this result shows great potential of RMB internationalization. Some reasons may contribute to this huge difference between simulation and reality: first, incomplete financial openness limits the demand for RMB, and much demand cannot be satisfied in the world market. Second, the rise in RMB’s proportion means some other currency’s proportion has declined. Natural competition impedes the rise of RMB, and it must take a long time for currency replacement. Third, China’s huge trade volume has not translated into the RMB used, and many Chinese firms still use US dollar as the invoicing currency and bear exchange rate fluctuation. Finally, some countries are unavoidably hostile to the emergence of China.

Table 6 Comparison Results

Economic Cooperation	True Value	Simulation Value
ASEAN “10+3”	6.72%	30.98%
Shanghai Cooperation Organization	31.95%	60.61%
Asia-Pacific Economic Cooperation	4.28%	6.29%

6 Conclusions

Through the comparison of the proportion of the most frequently used regional currency across different model specifications, a U-shaped relationship between the proportion of this regional currency and the degree of regional trade integration is found. In a nutshell, our results show that when the degree of dominance of a regional currency is low, it is costly to use a regional currency to substitute for an existing international currency, and the use of this currency impedes regional trade. However, as more countries adopt a single regional currency for trade settlement, the transaction cost falls, and the regional currency integration promotes regional trade. Then, in Section 5, we give the simulation results for the RMB proportion for “The Belt and Road” countries and find that RMB has much potential for being the most frequently used regional currency. But the reality differs markedly from the simulation results; China needs to open its capital account and promote RMB internationalization. Currency competition must occur with the change of regional currency. Policy coordination is important to help overcome the threshold and enjoy the positive impact on regional trade.

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Monetary Policy, Financial Development and the Financing of Zombie Firms: Evidence from China*

By LU LIPING, LI XIAOYANG, AND QIAN ZONGXIN*

Abstract: *This paper examines the financing channels for zombie firms in China. We find that equity markets and suppliers provide substantial financing support for zombie firms, while banks and other financing channels are less important. We also find that the amount of investment does not increase accordingly after zombie firms obtain external financing, which indicates an inefficient use of funds by these zombie firms. Our results are robust to various definitions of zombie firms, and also to a propensity score matching method..*

Keywords: Zombie firms; external financing; equity market; trade credit

Introduction

Keynesian macroeconomics proposes that central banks should use monetary policy to smooth economic fluctuations. In particular, when there is a recession or a recession is anticipated, central banks should employ a loose monetary policy to stimulate the economy. In developing countries, government agencies also have long-term targets of ensuring economic growth and smoothing business cycles. Financial development policies such as liberalising the banking sector are often part of the policy package for enhancing economic growth.¹

China often uses the monetary policy to smooth its business cycles and employs financial development policies to promote long-term economic growth. One dramatic example of China's counter-cyclical monetary policy is the four-trillion stimulus plan (Zheng, Wang, and Xu 2018) in anticipation of the negative spillover of the 2008 global financial crisis. The M2 growth rate reached 27.7% in 2009, which was ten percentage points higher than the level of 2008. However, by the end of 2009, the People's Bank of China (PBOC) tightened its monetary policy due to a concern about over-expansion. Besides, the China Banking and Insurance Regulatory Commission (CBIRC) and the China Securities Regulatory Commission (CBRC) set policy targets to promote the development of the specific financial sector within their supervision sovereign.

In this paper, we show that the counter-cyclical monetary policy and financial development policies have had an unintended side effect of resource misallocation in China. Specifically, these policies have made it easier for zombie firms to obtain external financing, which can diminish the financing available to other firms. Therefore, the authors recommend a scheme to limit the extent to which banks can exploit their private information. By aligning the banks' incentives with regulators' incentives, we propose a method to help prevent lending to zombie firms. Also, we investigate the impact of macro-financial policies, i.e. the monetary policy and financial development policies, on the financing of zombie firms. We show that monetary expansion and financial development targeted at macroeconomic stability and economic growth could enhance the financing of zombie firms. Therefore, for macroprudential purposes, these policies need to make a trade-off between influencing macroeconomic performance and preventing lending to zombie firms. Our paper further complements the literature by providing a broader perspective of

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¹ See Levine (1997) for a review of the economic rationale.

zombie firm financing. While the literature often examines banks' lending to zombie firms, we investigate both bank loans and other external financing channels for the firms. Adrian and Shin (2009) show that leverage through nonbank financing could have a significant impact on macroeconomic fluctuations and financial stability.

Our paper is also related to the literature on the unintended effects of monetary policy and financial development. Triggered by the 2008 global financial crisis, a large body of literature has discussed the impact of monetary policy on the risk-taking behaviours of financial institutions (Borio and Zhu 2012; Jimenez et al. 2014; Bruno and Shin 2015). Our paper adds to this aspect of the literature by looking at the side effects of monetary policy and financial development from the perspective of lending to zombie firms.

Previous research has addressed several related problems. For instance, Caballero, Hoshi, and Kashyap (2008) explain that Japanese zombie firms depress both the growth of investment and employment of non-zombie firms and find that the undercapitalised banks in Japan tend to support zombie firms, who are not willing to recognise the losses of non-performing loans. In addition, Kwon, Narita, and Narita (2015) find that lending to zombie firms in the 1990s reduced the aggregate productivity growth in Japan, which exhibited severe resource misallocation. However, very few papers investigate how to prevent lending to zombie firms. Bruche and Llobet (2014) show that banks with bad loans are better informed than regulators, and these banks can use their information advantage to maximise the amount of transfers they could receive during a regulatory intervention, and that this distortion can encourage lending to zombie firms.

This paper proceeds as follows. The first section introduces the institutional background of lending to zombie firms. Then, it discusses the identification of zombie firms. In the following three sections, we develop our hypotheses, present the methodology used and the data, and present the results. Next, we show how zombie firms use the funds obtained through external financing and then conduct robustness checks. The final section concludes the paper.

Institutional background

There are three typical tools for medium- and long-term external financing for firms listed on a stock exchange, i.e. bank loans, equity, and corporate bonds. Table 1 shows the value of external financing from 2004 to 2016. Loan financing plays a dominant role over the years. When the four trillion stimulus plan was implemented by the Chinese government in 2009, loan financing doubled and reached 9.59 trillion yuan, which accounted for 68.97% of the total financing in the real economy. Equity financing played a relatively less important role, and grew from 67 billion yuan in 2004 to 1.242 trillion yuan in 2016. Bond financing witnesses a dramatic increase during the past 13 years, i.e. bond issuance accounted for 1.64% of the total financing at the outset, while this ratio reached 16.85% in 2016.

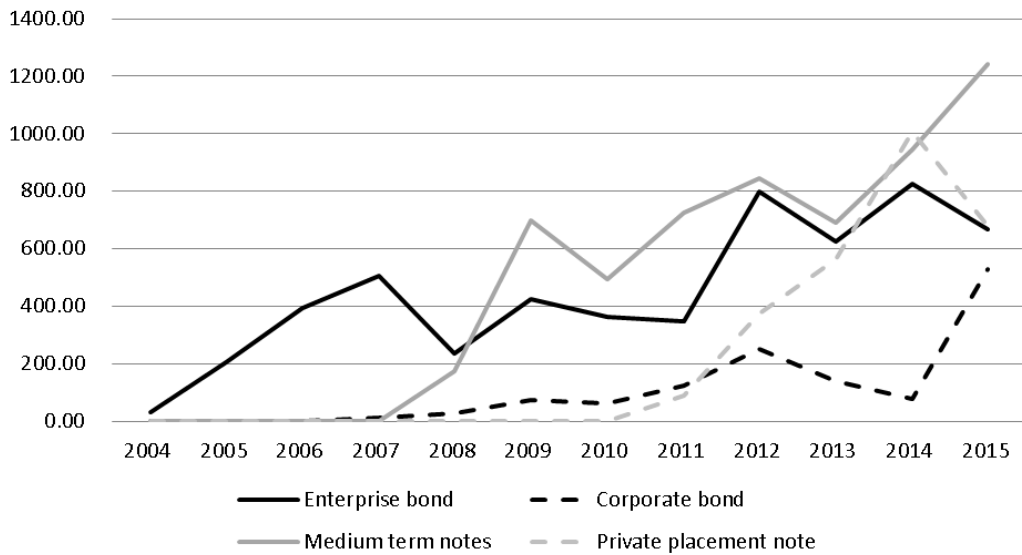


Figure 1. Bond financing by instruments (in billion of RMB).

Data sources: Data before 2014 is from *Almanac of China's Finance and Banking* by PBOC, and data in 2015 is from the Wind database.

Table 1. Annual flow of external financing channels (in billion of RMB).

Year	AFRE	Foreign					Corporate bonds ²	Equity financing by non-financial firms
		RMB loans	Foreign currency loans	Entrusted loans	Trust loans	Banker's acceptances		
2004	2,863	2,267	138	312	0	-29	47	67
2005	3,001	2,354	141	196	0	2	201	34
2006	4,270	3,152	146	269	83	150	231	154
2007	5,966	3,632	386	337	170	670	229	433
2008	6,980	4,904	195	426	315	107	552	333
2009	13,911	9,594	927	678	436	461	1,237	335
2010	14,019	7,945	485	875	386	2,335	1,106	579
2011	12,829	7,472	571	1,296	203	1,027	1,366	438
2012	15,763	8,204	916	1,284	1,285	1,050	2,255	251
2013	17,317	8,892	585	2,547	1,840	776	1,811	222
2014	16,413	9,781	356	2,507	517	-129	2,382	435
2015	11,333	1,126	-643	1,591	43	-1057	2,825	760
2016	17,802	1,243	-564	2,185	859	-1953	2,999	1,242

Data source: PBOC's *Aggregate Financing to the Real Economy* from 2004 to 2016.

We present summary statistics for the bond and equity issuance by all listed firms in China from the Wind database³ in Table 2. Equity financing has been more frequently employed than bond

² The term corporate bonds here refers to all kinds of bonds issued by firms, instead of a specific type of bond.

³ There are also records of bonds issued by non-listed or off-shore listed firms. However, our analysis focusses on the financing patterns of listed A-share

financing by listed firms. Chinese listed firms do not employ bonds as a regular tool for external financing, although they can raise more funds from a single bond issuance, e.g. the average size of bond financing is 1.98 billion yuan, which is 1.3 times higher than the equity financing.

Table 2. Summary statistics of bond and equity financing (in billions of RMB).

	Total	State owned	Private
<i>Bond</i>			
Observations	1,014	632	382
Average Amount (million)	1,977.49	2,512.00	1093.16
<i>Equity</i>			
Observations	2,272	984	1,288
Average Amount (million)	1,473.40	1,940.98	1,116.19

Data source: the Wind database.

Loan financing

China has a bank-dominated financial system. Loan financing accounted for about 95% of the total financing to the real economy in 2004, while it decreased to 69.86% in 2016 with the development of the equity and bond markets. On average, ordinary loans accounted for 85.94% of the medium- and long-term loan financing during 2011-2014, syndicated loans for 12.40%, and 1.66% for trade financing, loans for mergers and acquisitions, and others (see the *Almanac of China's Finance and Banking* from 2004 to 2016). Unfortunately, there is no detailed record of bank loans to listed firms,⁴ so we use increases in long-term loans as a proxy for firms' long-term loan financing.

Equity financing

Equity financing is not a major external financing tool in China. However, China's listed firms have a strong preference for equity financing due to the poor protection of investors. There are two ways of obtaining equity financing for listed firms, i.e. seasoned equity offering (SEO) and the allotment of shares. In our sample, SEOs were used more frequently (2,221 records), while share allotment was not commonly used (120 records).

Bond financing

The issuance volume of enterprise bonds increased about 35 times in China during 1987-1992. However, a massive default occurred afterwards (Pessarossi and Weill 2013). Also, the burgeoning of enterprise bonds squeezed out national bonds, e.g. the issuance of national bonds faced severe difficulties in 1993. Since then, China's bond market has been tightly regulated with the promulgation of a set of regulatory rules.

According to the *Securities Law of China*, a firm has to satisfy a series of requirements to be eligible to issue corporate bonds, such as meeting the criteria for firm size, issuance size, interest coverage ratio, industry, and interest rate. In addition, a firm needs to specify the intended fund usage before issuing bonds, and the funds raised through the public issuance of corporate bonds should be used for the purpose stated and cannot be used to cover deficits or non-production expenditures. The tight regulatory framework increases the cost of bond financing, which leads to the lower issuance of bonds. Furthermore, poorly performing firms at risk of delisting, such as a type of zombie firm, can barely meet these regulatory requirements (in our sample only two of them have issued bonds).

firms.

⁴ China Stock Market & Accounting Research releases the bank loan announcements of listed firms. However, it is not compulsory for listed firms to announce every bank loan, which results in a severe sample selection problem and cannot satisfy the criterion for our research.

Trade credit

Apart from formal financing channels, trade credit has also become a remarkable tool for external financing, especially during the economic downturns. The delay in payment by a firm spills over to its business partners, which may trigger a triangular debt problem and increase the reliance on trade credit. Trade credit (e.g. accounts payable, bills payable and advances from customers) accounts for 34.7% of total liabilities. We identify the use of trade credit by determining whether the annual increase of the trade credit is higher than 5%.

Identification of zombie firms

Zombie firms often survive with the help from creditors or government (Kane 1987; 2000). Ahearne and Shinada (2005) define zombie firms as those companies with low productivity and high debt. However, this definition does not capture the essential characteristics of zombie firms. For example, firms in the heavy industries whose profit mainly relies on the economies of scale are often highly indebted and less productive. However, these firms can still be healthy and profitable, and thus it may be unfair to categorise them as zombie firms.

Hoshi (2006) makes an interesting analogy between zombie firms and the zombies in Hollywood films, which helps reveal the typical traits of zombie firms. Similar to human zombies who drain blood and attack humans, zombie firms rely on subsidies and hurt healthy firms. Thus, Caballero, Hoshi, and Kashyap (2008) propose the CHK criterion, which defines zombie firms as those companies receiving subsidised credit from creditors.

Subsidised zombie firms and CHK criterion

Specifically, the CHK criterion identifies firms that pay an interest expense ($R_{i,t}$) that is lower than the theoretical minimal interest expense ($R_{i,t}^*$) as zombie firms. The minimal interest expense ($R_{i,t}^*$) is calculated as follows:

$$R_{i,t}^* = rs_{t-1} * BS_{i,t-1} + \left(\frac{1}{5} \sum_{j=1}^5 rl_{t-j}\right) * BL_{i,t-1} + rcb_{\min \text{ over last } 5 \text{ years}, t} * Bonds_{i,t-1},$$

where $BS_{i,t}$, $BL_{i,t}$ and $Bonds_{i,t}$ stand for balance of short-term loans, long-term loans, and bond of firm i at the end of year t ; in rs_t , rl_t and $rcb_{\min \text{ over last } 5 \text{ years}, t}$ represents the average short-term prime rate, average long-term prime rate, and the minimum observed coupon rate in year t .

The assumption behind the calculation of theoretical minimal interest expenses ($R_{i,t}^*$) is that firm i obtained all of its interest-bearing liabilities at the lowest cost available. Should the actual interest expense be less than this lower boundary, it might be due to subsidies from creditors such as debt forgiveness, interest rate concessions, debt for equity swaps, or moratoriums on interest rate payments.

We make two modifications to the CHK criterion to make it applicable to China's listed firms. On one hand, instead of using the prime rate, we use the discounted benchmark rate of the PBOC. Six-month and one-year benchmark rates are used for short-term and long-term loan rates, respectively. Financial institutions are required to set loan rates within a certain interval around the benchmark rate in China. The POBC adjusts the benchmark rate as a monetary policy tool. This unique regulatory requirement guarantees that no interest rate shall be less than the lower boundary of the interval around the benchmark, and thus it provides us with a more trustworthy estimate of the minimal interest rate. Appendix 1 lists the benchmark rate, floating range and minimum rate during our sample period. On the other hand, disaggregated bond data is available for China's listed firms, which enables us to divide the bonds into short-term and long-term bonds, calculate their minimum coupon payments, and obtain a more accurate estimate of the firms' theoretical minimum interest expenses ($R_{i,t}^*$).

We replace $rcb_{\min \text{ over last } 5 \text{ years}, t} * Bonds_{i,t-1}$ with the sum of (i) $cps_{t-1} * BondS_{i,t-1}$

and (ii) $\left(\frac{1}{5}\sum_{j=1}^5 cpl_{t-j}\right) * BondL_{i,t-1}$, where $BondS$ and $BondL$ are short-term and long-term bonds; cps and cpl are the observed minimum coupon rate for short-term and long-term bonds, respectively. Finally, we derive our estimate of the theoretical minimum interest expenses ($R_{i,t}^*$) as follows:

$$R_{i,t}^* = rs_{t-1} * BS_{i,t-1} + \left(\frac{1}{5}\sum_{j=1}^5 rl_{t-j}\right) * BL_{i,t-1} + cps_{t-1} * BondS_{i,t-1} + \left(\frac{1}{5}\sum_{j=1}^5 cpl_{t-j}\right) * BondL_{i,t-1}.$$

Poorly-performing zombie firms and STPT criterion

While the CHK criterion accurately depicts the type of zombie firms that rely on subsidies from creditors, it leaves out another type of zombie firms, i.e. poorly-performing zombie firms. Poorly-performing firms often face consecutive deficits, technical bankruptcy (i.e. their total liabilities exceed their total assets), and their potential risks of big losses or delisting, and so forth. Similar to the CHK zombies, these firms should have gone bankrupt and been delisted from the stock market, but they still remain active. They consume resources and destroy healthy firms, which is harmful to the economy.

The China Securities Regulatory Commission (CSRC) publishes a special treatment list for poorly-performing firms, i.e. the ‘ST’ label is put in front of the stock name of firms as a warning to investors. For those firms facing an immediate risk of delisting, the ‘*ST’ label is put in front of the stock name (the ‘*ST’ warning label used to be ‘PT’). The ‘ST’ and ‘*ST’ list enable us to identify a sample of poorly-performing firms. We thus identify poorly performing firms according to the ‘ST’ and ‘*ST’ list and categorise them as STPT zombies.

Subsidised and poorly-performing zombie firms and FN criterion

In 2011, Fukuda and Nakamura (FN) proposed the FN criterion based on CHK criterion; the FN criterion can be used to detect firms that rely on subsidies and perform poorly (FN zombies). Their first adjustment ensures that the FN criterion does not include firms with an EBIT higher than minimum interest expenses ($R_{i,t}^*$) as zombies, even if their actual interest payment ($R_{i,t}$) is lower than $R_{i,t}^*$. It is very useful for distinguishing low interest payments that are due to subsidies from the bargaining power. This adjustment decreases the type one error, i.e. categorising healthy firms as zombies (Fukuda and Nakamura 2011).

Also, the FN criterion further categorises firms with an EBIT lower than the minimum interest expenses ($R_{i,t}^*$) and an increasing borrowing amount as zombie firms. Banks may also support troubled firms through ‘evergreen lending’ other than direct subsidies. Thus, the FN criterion augments the CHK criterion, and the FN criterion also reduces the type two error (i.e. categorising zombie firms as healthy firms).

Hypotheses

Zombie firms, according to our definition, should be less profitable and more financially risky than healthy firms. As a result, lenders, shareholders and other investors are not willing to provide financing to them. Therefore, we propose our first hypothesis:

H1: Zombie firms (CHK, STPT and FN) are less likely to obtain formal financing.

Formal financing refers to loan, bond and equity financing. Although zombie firms have limited access to formal financing in general, they are still prevalent in the market, which suggests that some financiers indeed help zombie firms survive. We will analyse various financing channels that are available to zombie firms.

As CHK zombies rely on subsidies from the government and/or creditors, they are not favoured

by banks. They do not offer any advantage in equity financing either. Subsidies, as a type of non-operating income, are not sustainable and quite volatile. Thus, the stocks of CHK zombie firms are riskier and less attractive than healthy firms with similar performance.

However, CHK zombies may resort to their suppliers for trade credit, which is different from bank financing in the sense that suppliers have proprietary information about these firms (Petersen and Rajan 1997). Therefore, suppliers have a better understanding of the implicit support offered by the government to CHK zombies than banks and equity investors, so suppliers finance these firms through trade credits. As a result, CHK zombies may use trade credits from their suppliers.

STPT zombies have high default risks and perform poorly, and thus both banks and suppliers are cautious about granting credit to them. However, instead of being discriminated by creditors, these firms are often chased by investors in the stock market. Due to the high financial and regulatory costs of IPOs in the stock market, listed firms have remarkable shell values. When a listed firm performs poorly over a few consecutive years, parent firms and large shareholders often prop up the firm to avoid delisting and keep its shell value. Apart from these insiders, other non-listed firms may seek the chance to gain a back-door listing by purchasing the stock of STPT zombies.

FN zombies are the worst type of zombie firms, and they are not attractive to either banks or suppliers; we conjecture that they have difficulty in obtaining financing from any channel. Therefore, we propose our second set of hypotheses on the financing channels that keep the three types of zombie firms afloat in China:

H2a: CHK zombies could obtain financing from suppliers (trade credits), despite being discriminated in other markets.

H2b: STPT zombies could obtain financing from the equity market despite being discriminated in other markets.

H2c: FN zombies are discriminated in all markets.

We also examine the impact of monetary policy on the choice of financing channels by zombie firms. Monetary policy influences the behaviours of households, firms and financial institutions by adjusting the interest rates and money supply; this can affect firms' access to finance in general. However, zombie lending is a structural issue (i.e. financial resources allocated to poorly performing firms), which cannot be alleviated by a loose monetary policy. Even worse, a loose monetary policy may aggravate the resource misallocation. We thus propose our third hypothesis:

H3: Zombie firms (CHK, STPT and FN) benefit more from loose monetary policy comparing to healthy firms.

Also, we investigate the role of financial developments in zombie firms' financing. Financial development may enhance resource allocation and facilitate economic growth. We will examine whether this theory still holds in an economy, like China's, that is congested with zombie firms.

On one hand, financial development can alleviate information asymmetry between fund suppliers and users. As a result, financial resources can be allocated in a more efficient manner, e.g. with less funds allocated to zombie firms. On the other hand, financial development can also harm credit allocation efficiency via loose monetary policy. For example, an abundant supply of funds leads to lower requirements, and thus helps zombie firms obtain funds easily. We propose our fourth hypothesis as follows:

H4: Zombie firms (CHK, STPT and FN) benefit more from financial development compared to healthy firms.

We also examine the use of funds by zombie firms, which may shed light on the misallocation of funds. Zombie firms are subject to severe agency problems and cream-skimming due to conflicts of interest. We thus suspect that even if zombie firms receive external funds, they may not use them in an efficient way. In particular, we suspect that zombie firms are more likely to

channel the funds away from the firm rather than investing the funds in the firm.

Besides, zombies are often more heavily indebted than healthy firms, and thus face higher burdens of debt repayment. Zombie firms may pursue external financing to repay their debts earlier, which is consistent with the concept of ‘zombie lending’, ‘forbearance lending’ or ‘evergreening’ (Sekine, Kobayashi, and Saita 2003; Fukuda and Nakamura 2011; Kwon, Narita, and Narita 2015).

Thus, our fifth hypothesis is as follows:

H5: Instead of increasing real investment, zombie firms (CHK, STPT and FN) spend more on debt repayment and dividend distribution than healthy firms.

Data and methodology

Our data set consists of 2,749 listed non-financial firms in China. To alleviate concern regarding the reform of non-tradable shares,⁵ we limit our sample period to 2005–2015. After excluding records with missing data, we have 19,999 firm-year observations. Firm level information is retrieved from the Wind and CSMAR databases, and the macroeconomic indicators are obtained from the National Bureau of Statistics of China (NBS), CSRC and PBOC. We winsorise firm-specific variables at the 1st and 99th percentiles.

We focus on three types of formal financing, namely loan, equity, and bond financing. We use changes in long-term loans to measure the loan financing, i.e. a dummy indicating an increase of long-term loans above 5%. Furthermore, we use the SEOs or share allotment to measure the equity financing. The Wind database has a full record of the bonds issued by listed firms, and thus allows us to identify whether a firm has bond financing in a specific year or not. Firms without a financing channel are categorised as having no formal financing. In addition, we examine whether the changes to firms’ trade credits are above 5% to measure the trade credit.

Table 3 shows an overview of firms’ financing choices by year. Loan and equity financing are the major financing tools, while bond financing is not used very much. All three financing tools exhibit an upward trend. Also, trade credit plays an important role.

Table 3. Firms’ financing choice by year.

		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Loan	Yes	365	391	405	424	591	509	618	582	775	694	747
	No	898	886	923	1015	923	1107	1330	1644	1626	1709	1783
Bond	Yes	1	3	15	18	58	35	120	201	156	167	238
	No	1276	1338	1441	1515	1571	1937	2130	2130	2250	2363	2511
Equity	Yes	3	56	162	131	133	169	190	153	249	384	597
	No	1274	1285	1294	1402	1496	1803	2060	2251	2157	2146	2152
Formal financing	Yes	382	481	620	601	676	964	1041	967	1014	1148	1426
	No	895	860	836	932	862	1008	1209	1437	1392	1382	1323
Trade credit	Yes	491	472	539	648	559	541	743	881	888	1021	1131
	No	729	766	761	756	926	1036	1171	1325	1473	1348	1361

Panels A to D of Table 4 compare the characteristics of firms that have obtained formal, loan, equity financing, and trade credits, respectively, and versus other firms without a financing tool. The variable definitions are listed in Appendix 2.

⁵The reformation initiated in 2005, which aims to improve the shareholder structure of listed firms.

Table 4. Summary statistics of independent variables.

	No. of Obs.		Mean			Std. Dev.		Min		Median		Max	
	Yes	No	Yes	No	Diff	Yes	No	Yes	No	Yes	No	Yes	No
Panel A: Formal													
<i>CHK</i>	7384	9995	0.191	0.186	0.005	0.393	0.389	0	0	0	0	1	1
<i>STPT</i>	9410	12075	0.038	0.102	-0.0639***	0.192	0.303	0	0	0	0	1	1
<i>FN</i>	7297	9921	0.070	0.068	0.002	0.255	0.251	0	0	0	0	1	1
<i>Size</i>	9410	12075	7.596	6.954	0.0054***	1.474	1.481	2.868	2.868	7.467	6.939	11.284	11.284
<i>Tangibility</i>	9410	12075	0.239	0.253	-0.0137***	0.181	0.175	0.002	0.002	0.202	0.219	0.756	0.756
<i>Age</i>	9410	12075	8.382	8.991	-0.6094***	6.251	5.729	0	1	8	9	25	25
Panel B: Loan													
<i>CHK</i>	5541	11585	0.178	0.185	-0.007	0.383	0.388	0	0	0	0	1	1
<i>STPT</i>	6101	13789	0.047	0.095	-0.0479***	0.211	0.293	0	0	0	0	1	1
<i>FN</i>	5485	11505	0.081	0.064	0.0170***	0.273	0.245	0	0	0	0	1	1
<i>Size</i>	6101	13789	7.761	7.071	0.6900***	1.459	1.498	2.868	2.868	7.624	7.032	11.284	11.284
<i>Tangibility</i>	6101	13789	0.258	0.251	0.0071***	0.187	0.175	0.002	0.002	0.228	0.217	0.756	0.756
<i>Age</i>	6101	13789	9.974	9.107	0.8677***	5.455	5.749	1	1	10	9	25	25
Panel C: Equity													
<i>CHK</i>	2034	15345	0.169	0.191	-0.0220***	0.375	0.393	0	0	0	0	1	1
<i>STPT</i>	2227	19258	0.067	0.075	-0.0083*	0.250	0.264	0	0	0	0	1	1
<i>FN</i>	2013	15205	0.035	0.073	-0.0380***	0.183	0.260	0	0	0	0	1	1
<i>Size</i>	2227	19258	7.807	7.169	0.6380***	1.315	1.519	2.868	2.868	7.643	7.097	11.284	11.284
<i>Tangibility</i>	2227	19258	0.226	0.250	-0.0239***	0.169	0.179	0.002	0.002	0.189	0.215	0.756	0.756
<i>Age</i>	2227	19258	9.681	8.614	1.0670***	5.564	6.007	0	0	9	8	25	25
Panel D: Trade credit													
<i>CHK</i>	10069	6743	0.181	0.184	-0.003	0.385	0.388	0	0	0	0	1	1
<i>STPT</i>	11650	7901	0.054	0.108	-0.0547***	0.225	0.311	0	0	0	0	1	1
<i>FN</i>	9968	6688	0.059	0.086	-0.0270***	0.235	0.280	0	0	0	0	1	1
<i>Size</i>	11650	7901	7.428	7.137	0.2903***	1.446	1.557	2.868	2.868	7.322	7.116	11.284	11.284
<i>Tangibility</i>	11650	7901	0.241	0.267	-0.0264***	0.171	0.182	0.002	0.002	0.208	0.238	0.756	0.756
<i>Age</i>	11650	7901	8.902	10.05 1	-1.1486***	5.657	5.631	1	1	8	10	25	25

Generally speaking, zombie firms are less likely to raise funds from any of these financing tools. However, the mean of the FN zombies in Panel B is significantly higher than that of non-FN zombies, which may be caused by simultaneity. Insolvent firms with increasing loan financing are more likely to be classified as FN zombies. When we use the lagged FN zombies, we consistently find that zombie firms obtained less external financing.

Table 5 shows the correlation of variables. The correlation coefficient of STPT zombies and size is -0.277, while the correlation among the zombie indicators and control variables are even smaller, which alleviates concerns about multi-collinearity.

Table 5. Correlation table.

	[1]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	
Loan	[1]	1								
Equity	[3]	0.095	1							
Formal	[4]	0.834	0.349	1						
Trade credit	[5]	0.080	0.064	0.089	1					
CHK	[6]	-0.007	-0.018	0.008	-0.005	1				
STPT	[7]	-0.083	-0.014	-0.111	-0.102	-0.021	1			
FN	[8]	0.029	-0.049	0.002	-0.055	0.090	0.040	1		
Size	[9]	0.205	0.136	0.172	0.096	-0.016	-0.277	-0.088	1	
Tangibility	[10]	0.025	-0.045	-0.017	-0.070	-0.092	0.040	0.059	0.100	1
Age	[11]	0.065	0.066	-0.079	-0.099	0.011	0.160	0.056	0.180	0.026

We test the hypothesis using a linear probability model (LPM). Non-linear models with a comprehensive set of fixed effects may come across incidental parameter problems and yield inconsistent estimates. The LPM is as follows:

$$\text{Financing choice}_{i,t} = \text{Zombie}_{i,t-1} * \beta_0 + \text{Character}_{i,t-1} * \beta_1 + \text{Macro}_{i,t} * \beta_2 + \gamma_i + \delta_t$$

Financing choice is a set of binary variables: *Formal*, *Loan*, *Equity* and *Trade credit*. *Zombie* includes the three zombie indicators, *CHK*, *STPT* and *FN*, whose coefficients reflect the financing patterns of different types of zombie firms. *Character* is a set of firm level control variables such as *Size*, *Tangibility* and *Age*. All firm level variables are lagged by one year to alleviate the endogeneity problem.

Macro stands for the macroeconomic indicators of the firms' location. γ and δ capture firm and year fixed effects, respectively, and *Macro* and δ will not be included in the same equation. The definitions and descriptive statistics of these variables are given in Appendix 2 and Table 4.

Results

Our baseline model includes zombie indicators, firm characteristics, macroeconomic indicators and firm fixed effects. Groups A to D use Formal loan, Equity and Trade credit as independent variables, sequentially. We use the zombie indicators of CHK, STPT and FN as different specifications.

Table 6 shows that the coefficients of the zombie indicators are negative with CHK and FN being significant at the 10% and 1% levels, which suggests that all kinds of zombie firms are less likely to obtain formal financing. The probability of formal financing for CHK zombies and FN zombie is lower than that for healthy firms by 1.98% and 8.42%, respectively. We then disaggregate the formal financing by using different tools.

Table 6. LPM for the choice of financing channels.

	(A) Formal			(B) Loan			(C) Equity			(D) Trade credit		
	CHK (1)	STPT (2)	FN (3)	CHK (4)	STPT (5)	FN (6)	CHK (10)	STPT (11)	FN (12)	CHK (13)	STPT (14)	FN (15)
Zombie	-0.0198* (0.0107)	-0.0115 (0.0159)	-0.0842*** (0.0165)	-0.0125 (0.0104)	-0.0261* (0.0146)	-0.0757*** (0.0164)	-0.0176** (0.0072)	0.0284*** (0.0106)	-0.0161 (0.0106)	0.0512*** (0.0118)	-0.0350* (0.0181)	-0.0651*** (0.0176)
Size	0.0363*** (0.0077)	0.0388*** (0.0069)	0.0345*** (0.0077)	0.0205*** (0.0075)	0.0206*** (0.0068)	0.0190** (0.0075)	-0.0061 (0.0075)	-0.0022 (0.0046)	-0.0067 (0.0051)	-0.0474*** (0.0083)	-0.0510*** (0.0078)	-0.0515*** (0.0083)
Tangibility	-0.3198*** (0.0458)	-0.2175*** (0.0413)	-0.3052*** (0.0458)	-0.4303*** (0.0446)	-0.3385*** (0.0402)	-0.4247*** (0.0443)	0.0972*** (0.0304)	0.1346*** (0.0263)	0.1048*** (0.0305)	-0.2316*** (0.0500)	-0.2410*** (0.0450)	-0.2420*** (0.0502)
Age	0.0149*** (0.0019)	0.0182*** (0.0017)	0.0154*** (0.0019)	0.0014 (0.0018)	0.0047*** (0.0016)	0.0014 (0.0018)	0.0170*** (0.0010)	0.0180*** (0.0010)	0.0174*** (0.0010)	-0.0038* (0.0020)	-0.0028 (0.0018)	-0.0038* (0.0020)
M2_growth	0.4023*** (0.1094)	0.3454*** (0.0902)	0.4093*** (0.1100)	0.5773*** (0.1105)	0.5288*** (0.0910)	0.5718*** (0.1114)	-0.0014 (0.0690)	-0.0217 (0.0555)	0.0148 (0.0701)	0.3497*** (0.1168)	0.3551*** (0.0972)	0.3598*** (0.1180)
Stock_return	0.0171** (0.0072)	0.0262*** (0.0063)	0.0192*** (0.0072)	0.0112 (0.0071)	0.0189*** (0.0062)	0.0101 (0.0071)	0.0158*** (0.0045)	0.0203*** (0.0041)	0.0170*** (0.0046)	0.0063 (0.0083)	0.0081 (0.0074)	0.0036 (0.0084)
Constant	0.0302 (0.0582)	-0.0570 (0.0508)	0.0341 (0.0580)	0.1858*** (0.0572)	0.1132** (0.0501)	0.1981*** (0.0571)	-0.0296 (0.0381)	-0.0794** (0.0324)	-0.0358 (0.0379)	0.9663*** (0.0626)	0.9939*** (0.0554)	1.0133*** (0.0627)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: (1) Dependent variable equals 1 when a firm uses a financing channel and 0 otherwise. (2) Firm characteristics, macroeconomic indicators and firm fixed effects are controlled. (3) Dependent variables in Groups A to D are *Formal*, *Loan*, *Equity* and *Trade credit*, respectively. (4) CHK, STPT and FN are used as indicators for zombie firms. (5) All firm level variables are lagged by one period, robust standard errors in parentheses. (6) *, **, and *** indicate significance at the 10%, 5% and 1% level, respectively.

CHK zombies, i.e. firms with subsidies from creditors, are not favoured by banks or equity investors. However, the significantly positive coefficient in specification (13) suggests that they have a 5.12% higher chance of receiving in formal financing (trade credit). This result corroborates our hypothesis that suppliers, with their closer ties to CHK zombies, have more information about their implicit governmental support, and thus are more willing to finance these zombie firms through trade credit.

STPT zombies, i.e. firms with poor financial performance, are difficult to obtain external financing except in the equity market. In fact, these firms seem to be preferred by equity investors. Once a listed firm performs poorly and faces the risk of delisting, insiders (parent firms and large shareholders) have incentives to prop up the firm in order to prevent delisting, and outsiders also have incentives to buy these stocks for the sake of the firm's shell value (i.e. the value created by being listed on the stock exchange). Consequently, the chances of equity financing for STPT zombies are higher than healthy firms by 2.84%.

The FN zombie firms, i.e. firms receiving subsidies and also performing poorly, is the worst type of zombie firm. These firms have difficulty accessing financing from all types of financing channels.

Influence of monetary policy

In the context of loose monetary policy, interest rate often goes down. We construct the variable, *Rate*, which equals 1 if the ten-year benchmark loan rate set by the PBOC is lower than the previous year, and 0 otherwise. In the same vein, we use another variable, *Reserve*, which equals to 1 if the year-end reserve rate is lower than that of the previous year, to capture the changes in monetary policy. We add their interaction terms to the zombie indicators to reveal the impact of monetary policy on zombie firms' financing patterns in the different panels.

Table 7. LPM for the choice of financing tools.

Panel A	(A) Formal			(B) Loan			(C) Equity			(D) Trade credit		
	CHK (1)	STPT (2)	FN (3)	CHK (4)	STPT (5)	FN (6)	CHK (10)	STPT (11)	FN (12)	CHK (13)	STPT (14)	FN (15)
Zombie	-0.0137 (0.0144)	-0.0195 (0.0192)	-0.1050*** (0.0240)	-0.0153 (0.0144)	-0.0310* (0.0180)	-0.0942*** (0.0238)	-0.0066 (0.0085)	0.0055 (0.0115)	-0.0357*** (0.0109)	0.0212 (0.0153)	-0.0386* (0.0222)	-0.0992*** (0.0264)
Rate*Zombie	-0.0143 (0.0205)	0.0285 (0.0247)	0.0343 (0.0312)	-0.0008 (0.0199)	0.0138 (0.0231)	0.0272 (0.0308)	-0.0185 (0.0132)	0.0718*** (0.0176)	0.0402** (0.0191)	0.0523** (0.0220)	0.0028 (0.0296)	0.0553 (0.0346)
Size	0.0378*** (0.0077)	0.0404*** (0.0070)	0.0366*** (0.0077)	0.0208*** (0.0075)	0.0212*** (0.0068)	0.0197*** (0.0075)	-0.0023 (0.0051)	0.0017 (0.0046)	-0.0023 (0.0051)	-0.0474*** (0.0084)	-0.0496*** (0.0078)	-0.0506*** (0.0084)
Tangibility	-0.3365*** (0.0461)	-0.2384*** (0.0416)	-0.3238*** (0.0461)	-0.4346*** (0.0447)	-0.3465*** (0.0405)	-0.4301*** (0.0445)	0.0662** (0.0304)	0.1022*** (0.0264)	0.0726** (0.0305)	-0.2090*** (0.0502)	-0.2243*** (0.0454)	-0.2237*** (0.0505)
Age issue	0.0155*** (0.0020)	0.0187*** (0.0018)	0.0152*** (0.0020)	-0.0022 (0.0020)	0.0014 (0.0018)	-0.0022 (0.0020)	0.0236*** (0.0011)	0.0239*** (0.0010)	0.0230*** (0.0011)	-0.0087*** (0.0022)	-0.0066*** (0.0020)	-0.0082*** (0.0022)
Constant	0.0907* (0.0546)	0.0056 (0.0478)	0.1023* (0.0541)	0.3026*** (0.0532)	0.2252*** (0.0471)	0.3126*** (0.0529)	-0.0886*** (0.0340)	-0.1244*** (0.0291)	-0.0863** (0.0337)	1.0366*** (0.0598)	1.0460*** (0.0537)	1.0730*** (0.0595)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	16,091	19,967	15,929	16,043	19,859	15,906	16,091	19,967	15,929	15,800	19,541	15,641
R-squared	0.0259	0.0279	0.0280	0.0144	0.0121	0.0164	0.0377	0.0438	0.0376	0.0165	0.0139	0.0166
Number of ticker	2,391	2,530	2,391	2,391	2,530	2,391	2,391	2,530	2,391	2,379	2,517	2,379

Panel B	(A) Formal			(B) Loan			(C) Equity			(D) Trade credit		
	CHK (1)	STPT (2)	FN (3)	CHK (4)	STPT (5)	FN (6)	CHK (10)	STPT (11)	FN (12)	CHK (13)	STPT (14)	FN (15)
Zombie	-0.0204 (0.0153)	-0.0152 (0.0198)	-0.0971*** (0.0259)	-0.0205 (0.0151)	-0.0239 (0.0185)	-0.0788*** (0.0255)	-0.0117 (0.0100)	0.0042 (0.0128)	-0.0485*** (0.0128)	0.0180 (0.0167)	-0.0379 (0.0236)	-0.0813*** (0.0302)
Reserve*Zombie	-0.0002 (0.0197)	0.0153 (0.0228)	0.0173 (0.0303)	0.0083 (0.0191)	-0.0019 (0.0210)	-0.0002 (0.0296)	-0.0065 (0.0129)	0.0612*** (0.0163)	0.0542*** (0.0182)	0.0489** (0.0219)	0.0010 (0.0284)	0.0202 (0.0360)
Size	0.0378*** (0.0077)	0.0402*** (0.0070)	0.0362*** (0.0077)	0.0207*** (0.0075)	0.0212*** (0.0069)	0.0193** (0.0075)	-0.0024 (0.0051)	0.0013 (0.0045)	-0.0025 (0.0050)	-0.0473*** (0.0084)	-0.0497*** (0.0078)	-0.0514*** (0.0084)
Tangibility	-0.3356*** (0.0461)	-0.2396*** (0.0415)	-0.3228*** (0.0461)	-0.4343*** (0.0447)	-0.3475*** (0.0404)	-0.4290*** (0.0445)	0.0672** (0.0304)	0.1002*** (0.0263)	0.0729** (0.0305)	-0.2104*** (0.0502)	-0.2244*** (0.0454)	-0.2220*** (0.0504)
Age issue	0.0153*** (0.0020)	0.0190*** (0.0018)	0.0156*** (0.0020)	-0.0021 (0.0019)	0.0015 (0.0018)	-0.0020 (0.0019)	0.0232*** (0.0011)	0.0247*** (0.0010)	0.0234*** (0.0011)	-0.0074*** (0.0021)	-0.0065*** (0.0020)	-0.0077*** (0.0021)
Constant	0.0937* (0.0544)	0.0039 (0.0480)	0.1009* (0.0542)	0.3017*** (0.0530)	0.2250*** (0.0472)	0.3124*** (0.0530)	-0.0839** (0.0340)	-0.1302*** (0.0294)	-0.0902*** (0.0337)	1.0198*** (0.0594)	1.0459*** (0.0540)	1.0716*** (0.0595)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	16,091	19,967	15,929	16,043	19,859	15,906	16,091	19,967	15,929	15,800	19,541	15,641
R-squared	0.0258	0.0278	0.0279	0.0144	0.0121	0.0163	0.0376	0.0435	0.0378	0.0164	0.0139	0.0164
Number of ticker	2,391	2,530	2,391	2,391	2,530	2,391	2,391	2,530	2,391	2,379	2,517	2,379

Notes: (1) Dependent variable equals 1 when a firm uses a financing tool and 0 otherwise. (2) Firm characteristics, macroeconomic indicators and firm fixed effects are controlled. (3) Dependent variables in Groups A to D are *Formal*, *Loan*, *Equity* and *Trade credit* respectively. (4) CHK, STPT and FN are used as indicators for zombie firms. (5) All firm level variables are lagged by one period, robust standard errors in parentheses. (6) *, ** and *** indicate significance at the 10%, 5% and 1% level, respectively.

In Panel A of Table 7, we focus on the changes in the benchmark rate. Group A examines the effect of monetary policy on formal financing. None of the interaction terms are significant, which suggests that monetary policy may not change the accessibility of formal financing for these zombie firms. Groups B to D of Table 7 show that a loose monetary policy gives CHK zombies an additional 5.23% chance of receiving informal financing. The STPT zombies' probability of receiving equity financing also increases by 7.18% compared to healthy firms. FN zombies also benefit from a monetary easing in the sense that the availability of equity financing increases more than it does in healthy firms. In Panel B, we replace the variable *Rate* with *Reserve*, and investigate the impact of changes in the reserve rate on the financing pattern of zombie firms. The results are very similar to those in Panel A.

Influence of financial development

We use two measurements for financial development at the province level (He, Xue, and Zhu 2016). One indicator is the loan to GDP ratio, and the other is the capitalisation to GDP ratio (total capitalisation of listed firms to GDP). We sort the financial development indicators by year. The top half is categorised as the high financial development group, while the bottom half is the low financial development group. We split the full sample into two subsamples, accordingly.

Table 8. LPM for the choice of financing channel.

Panel A: Formal	Loan to GDP												Capitalisation to GDP											
	CHK				STPT				FN				CHK				STPT				FN			
	High	Low	(2)	(1)	High	Low	(4)	(3)	High	Low	(6)	(5)	High	Low	(8)	(7)	High	Low	(10)	(9)	High	Low	(12)	(11)
Zombie	-0.0048 (0.0156)	-0.0322** (0.0154)	0.0281 (0.0242)	-0.0173 (0.0208)	-0.0662** (0.0261)	-0.1006*** (0.0216)	-0.0171 (0.0160)	-0.0310** (0.0150)	0.0226 (0.0242)	0.02323 (0.0213)	0.0226 (0.0242)	0.0233** (0.0233**)	0.0435*** (0.0154)	0.0436*** (0.0154)	-0.0844*** (0.0249)	-0.0868*** (0.0225)	0.0436*** (0.0154)	0.0436*** (0.0154)	0.0436*** (0.0154)	0.0436*** (0.0154)	0.0436*** (0.0154)	0.0436*** (0.0154)	0.0436*** (0.0154)	0.0436*** (0.0154)
Size	0.0285*** (0.0109)	0.0437*** (0.0111)	0.0330*** (0.0100)	0.0479*** (0.0100)	0.0283** (0.0111)	0.0419*** (0.0111)	0.0168 (0.0116)	0.0435*** (0.0117)	0.0233** (0.0106)	0.0436*** (0.0105)	0.0436*** (0.0106)	0.0436*** (0.0106)	0.0436*** (0.0106)	0.0436*** (0.0106)	0.0436*** (0.0106)	0.0436*** (0.0106)	0.0436*** (0.0106)	0.0436*** (0.0106)	0.0436*** (0.0106)	0.0436*** (0.0106)	0.0436*** (0.0106)	0.0436*** (0.0106)	0.0436*** (0.0106)	0.0436*** (0.0106)
Tangibility	-0.3073*** (0.0703)	-0.3522*** (0.0641)	-0.2055*** (0.0623)	-0.2737*** (0.0576)	-0.2920*** (0.0705)	-0.3380*** (0.0640)	-0.2708*** (0.0723)	-0.3813*** (0.0655)	-0.1533** (0.0648)	-0.2786*** (0.0572)	-0.1533** (0.0648)	-0.1533** (0.0648)	-0.1533** (0.0648)	-0.1533** (0.0648)	-0.2526*** (0.0727)	-0.3729*** (0.0656)	-0.1533** (0.0648)	-0.1533** (0.0648)	-0.1533** (0.0648)	-0.1533** (0.0648)	-0.1533** (0.0648)	-0.1533** (0.0648)	-0.1533** (0.0648)	-0.1533** (0.0648)
Age	0.0195*** (0.0028)	0.0118*** (0.0029)	0.0234*** (0.0026)	0.0147*** (0.0027)	0.0194*** (0.0028)	0.0121*** (0.0029)	0.0218*** (0.0030)	0.0121*** (0.0029)	0.0263*** (0.0028)	0.0161*** (0.0027)	0.0121*** (0.0029)	0.0121*** (0.0029)	0.0121*** (0.0029)	0.0121*** (0.0029)	0.0221*** (0.0030)	0.0125*** (0.0029)	0.0121*** (0.0029)	0.0121*** (0.0029)	0.0121*** (0.0029)	0.0121*** (0.0029)	0.0121*** (0.0029)	0.0121*** (0.0029)	0.0121*** (0.0029)	0.0121*** (0.0029)
Constant	0.0902 (0.0776)	0.1043 (0.0777)	-0.0123 (0.0681)	0.0117 (0.0689)	0.0931 (0.0781)	0.1133 (0.0772)	0.1649** (0.0818)	0.0971 (0.0811)	0.0341 (0.0721)	0.0174 (0.0718)	0.0341 (0.0721)	0.0341 (0.0721)	0.0341 (0.0721)	0.0341 (0.0721)	0.1709** (0.0818)	0.1081 (0.0807)	0.0341 (0.0721)	0.0341 (0.0721)	0.0341 (0.0721)	0.0341 (0.0721)	0.0341 (0.0721)	0.0341 (0.0721)	0.0341 (0.0721)	0.0341 (0.0721)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Obs	7,826	8,265	9,917	10,050	7,732	8,197	7,934	8,157	9,937	10,030	9,937	10,030	10,030	10,030	7,836	8,093	10,030	10,030	10,030	10,030	10,030	10,030	10,030	10,030
R-squared	0.0291	0.0245	0.0321	0.0259	0.0307	0.0268	0.0267	0.0232	0.0307	0.0249	0.0307	0.0249	0.0249	0.0249	0.0292	0.0249	0.0249	0.0249	0.0249	0.0249	0.0249	0.0249	0.0249	0.0249
No. of ticker	1,413	1,382	1,535	1,464	1,411	1,381	1,462	1,397	1,563	1,494	1,563	1,494	1,494	1,461	1,461	1,396	1,494	1,494	1,494	1,494	1,494	1,494	1,494	1,396

Panel B: Loan	Loan to GDP										Capitalisation to GDP													
	CHK		STPT		FN		CHK		STPT		FN		CHK		STPT		FN							
	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low						
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	
Zombie	-0.0097 (0.0151)	-0.0194 (0.0154)	0.0072 (0.0227)	-0.0391** (0.0193)	-0.0580** (0.0264)	-0.1006*** (0.0210)	-0.0146 (0.0157)	-0.0193 (0.0149)	0.0122 (0.0222)	-0.0544*** (0.0198)	-0.0663*** (0.0250)	-0.0915*** (0.0221)												
Size	0.0215*** (0.0103)	0.0215* (0.0110)	0.0232** (0.0094)	0.0231** (0.0100)	0.0213** (0.0104)	0.0196* (0.0110)	0.0114 (0.0107)	0.0193* (0.0116)	0.0141 (0.0101)	0.0195* (0.0103)	0.0112 (0.0108)	0.0163 (0.0116)												
Tangibility	-0.4129*** (0.0706)	-0.4591*** (0.0613)	-0.3177*** (0.0603)	-0.3869*** (0.0567)	-0.4004*** (0.0708)	-0.4557*** (0.0604)	-0.3729*** (0.0724)	-0.4966*** (0.0623)	-0.2722*** (0.0629)	-0.3920*** (0.0563)	-0.3602*** (0.0725)	-0.4976*** (0.0617)												
Age	0.0008 (0.0028)	-0.0046 (0.0028)	0.0045* (0.0026)	-0.0012 (0.0026)	0.0009 (0.0028)	-0.0044 (0.0028)	0.0025 (0.0029)	-0.0039 (0.0028)	0.0070*** (0.0027)	0.0000 (0.0025)	0.0027 (0.0029)	-0.0035 (0.0028)												
Constant	0.2436*** (0.0746)	0.3447*** (0.0768)	0.1552** (0.0656)	0.2670*** (0.0681)	0.2422*** (0.0749)	0.3608*** (0.0765)	0.3027*** (0.0772)	0.3544*** (0.0811)	0.1963*** (0.0692)	0.2709*** (0.0706)	0.2990*** (0.0774)	0.3746*** (0.0808)												
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs	7,794	8,249	9,851	10,008	7,716	8,190	7,904	8,139	9,868	9,991	7,821	8,085												
R-squared	0.0156	0.0164	0.0136	0.0146	0.0169	0.0194	0.0136	0.0172	0.0116	0.0152	0.0150	0.0200												
No. of ticker	1,413	1,381	1,535	1,464	1,411	1,381	1,462	1,397	1,563	1,494	1,461	1,396												

Panel C: Equity	Loan to GDP												Capitalisation to GDP															
	CHK				STPT				FN				CHK				STPT				FN							
	High	Low	(2)	(1)	High	Low	(4)	(3)	High	Low	(6)	(5)	High	Low	(8)	(7)	High	Low	(10)	(9)	High	Low	(12)	(11)	High	Low	(14)	(13)
Zombie	-0.0090 (0.0104)	-0.0245** (0.0101)	0.0512*** (0.0169)	0.0353** (0.0143)	-0.0019 (0.0169)	-0.0183 (0.0135)	-0.0098 (0.0104)	-0.0290*** (0.0164)	0.0543*** (0.0164)	0.0219 (0.0136)	0.0120 (0.0163)	-0.0120 (0.0163)	0.0543*** (0.0164)	0.0219 (0.0136)	0.0120 (0.0163)	-0.0120 (0.0163)	0.0543*** (0.0164)	0.0219 (0.0136)	0.0120 (0.0163)	0.0120 (0.0163)	0.0543*** (0.0164)	0.0219 (0.0136)	0.0120 (0.0163)	-0.0120 (0.0163)	-0.0120 (0.0163)	-0.0120 (0.0163)	-0.0120 (0.0163)	-0.0120 (0.0163)
Size	-0.0151** (0.0075)	0.0055 (0.0068)	-0.0115* (0.0065)	0.0103 (0.0062)	-0.0155** (0.0076)	0.0056 (0.0068)	-0.0199** (0.0085)	0.0031 (0.0071)	-0.0091 (0.0072)	0.0019 (0.0066)	0.0019 (0.0066)	-0.0208** (0.0084)	0.0031 (0.0071)	0.0019 (0.0066)	0.0019 (0.0066)	-0.0208** (0.0084)	0.0031 (0.0071)	0.0019 (0.0066)	0.0019 (0.0066)	0.0019 (0.0066)	-0.0208** (0.0084)	0.0031 (0.0071)	0.0019 (0.0066)	0.0019 (0.0066)	-0.0208** (0.0084)	0.0031 (0.0071)	0.0019 (0.0066)	0.0019 (0.0066)
Tangibility	0.0435 (0.0480)	0.0999** (0.0404)	0.0684 (0.0418)	0.1330*** (0.0346)	0.0529 (0.0482)	0.1063*** (0.0408)	0.0450 (0.0510)	0.0895** (0.0422)	0.0879** (0.0438)	0.1123*** (0.0365)	0.0504 (0.0512)	0.0974** (0.0428)	0.0895** (0.0422)	0.1123*** (0.0365)	0.0504 (0.0512)	0.0974** (0.0428)	0.0895** (0.0422)	0.1123*** (0.0365)	0.1123*** (0.0365)	0.0504 (0.0512)	0.0879** (0.0438)	0.1123*** (0.0365)	0.0504 (0.0512)	0.0974** (0.0428)	0.1123*** (0.0365)	0.0504 (0.0512)	0.0974** (0.0428)	0.1123*** (0.0365)
Age	0.0238*** (0.0016)	0.0231*** (0.0015)	0.0256*** (0.0015)	0.0239*** (0.0014)	0.0240*** (0.0016)	0.0232*** (0.0015)	0.0257*** (0.0017)	0.0214*** (0.0015)	0.0266*** (0.0016)	0.0233*** (0.0015)	0.0233*** (0.0015)	0.0215*** (0.0015)	0.0214*** (0.0015)	0.0233*** (0.0015)	0.0233*** (0.0015)	0.0215*** (0.0015)	0.0266*** (0.0016)	0.0214*** (0.0015)	0.0233*** (0.0015)	0.0233*** (0.0015)	0.0215*** (0.0015)	0.0215*** (0.0015)	0.0233*** (0.0015)	0.0233*** (0.0015)	0.0215*** (0.0015)	0.0215*** (0.0015)	0.0233*** (0.0015)	0.0233*** (0.0015)
Constant	0.0046 (0.0511)	-0.1489*** (0.0453)	-0.0399 (0.0426)	-0.1949*** (0.0402)	0.0013 (0.0510)	-0.1546*** (0.0452)	0.0351 (0.0573)	-0.1204** (0.0467)	-0.0575 (0.0468)	-0.1319*** (0.0418)	0.0385 (0.0468)	-0.1281*** (0.0567)	0.0385 (0.0468)	-0.1319*** (0.0418)	0.0385 (0.0468)	-0.1281*** (0.0567)	0.0385 (0.0468)	-0.1319*** (0.0418)	0.0385 (0.0468)	0.0385 (0.0468)	-0.1319*** (0.0418)	0.0385 (0.0468)	-0.1281*** (0.0567)	0.0385 (0.0468)	-0.1319*** (0.0418)	0.0385 (0.0468)	-0.1281*** (0.0567)	0.0385 (0.0468)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs	7,826	8,265	9,917	10,050	7,732	8,197	7,934	8,157	9,937	10,030	7,836	8,093	8,157	9,937	10,030	7,836	8,093	8,157	9,937	10,030	7,836	8,093	8,157	9,937	10,030	7,836	8,093	8,157
R-squared	0.0354	0.0403	0.0408	0.0455	0.0352	0.0398	0.0410	0.0334	0.0466	0.0378	0.0412	0.0325	0.0334	0.0466	0.0378	0.0412	0.0325	0.0334	0.0466	0.0378	0.0412	0.0325	0.0334	0.0466	0.0378	0.0412	0.0325	0.0334
No. of ticker	1,413	1,382	1,535	1,464	1,411	1,381	1,462	1,397	1,563	1,494	1,461	1,396	1,397	1,563	1,494	1,461	1,396	1,397	1,563	1,494	1,461	1,396	1,397	1,563	1,494	1,461	1,396	1,397

Panel D:	Loan to GDP						Capitalisation to GDP					
	CHK		STPT		FN		CHK		STPT		FN	
	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	
Trade credit												
Zombie	0.0494*** (0.0164)	0.0431** (0.0178)	-0.0368 (0.0260)	-0.0295 (0.0257)	-0.0112 (0.0254)	-0.1071*** (0.0237)	0.0543*** (0.0167)	0.0313* (0.0180)	-0.0242 (0.0267)	-0.0397 (0.0260)	-0.0290 (0.0257)	-0.0914*** (0.0234)
Size	-0.0567*** (0.0127)	-0.0376*** (0.0114)	-0.0556*** (0.0121)	-0.0457*** (0.0103)	-0.0589*** (0.0126)	-0.0430*** (0.0116)	-0.0736*** (0.0125)	-0.0435*** (0.0124)	-0.0730*** (0.0120)	-0.0471*** (0.0117)	-0.0774*** (0.0125)	-0.0492*** (0.0125)
Tangibility	-0.1857** (0.0763)	-0.2274*** (0.0689)	-0.1794*** (0.0692)	-0.2669*** (0.0618)	-0.2000*** (0.0770)	-0.2353*** (0.0690)	-0.1591** (0.0779)	-0.2733*** (0.0698)	-0.1513** (0.0721)	-0.2903*** (0.0615)	-0.1673** (0.0785)	-0.2839*** (0.0700)
Age	-0.0034 (0.0032)	-0.0110*** (0.0031)	-0.0036 (0.0029)	-0.0091*** (0.0029)	-0.0042 (0.0031)	-0.0105*** (0.0031)	0.0037 (0.0032)	-0.0159*** (0.0031)	0.0038 (0.0030)	-0.0130*** (0.0029)	0.0030 (0.0032)	-0.0151*** (0.0031)
Constant	1.0455*** (0.0902)	0.9887*** (0.0809)	1.0534*** (0.0832)	1.0476*** (0.0706)	1.0840*** (0.0902)	1.0406*** (0.0810)	1.0977*** (0.0897)	1.0954*** (0.0862)	1.1079*** (0.0833)	1.0965*** (0.0783)	1.1490*** (0.0892)	1.1429*** (0.0863)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs	7,667	8,133	9,686	9,855	7,575	8,066	7,772	8,028	9,700	9,841	7,675	7,966
R-squared	0.0183	0.0176	0.0154	0.0156	0.0172	0.0205	0.0173	0.0227	0.0145	0.0196	0.0159	0.0253
No. of ticker	1,400	1,375	1,520	1,456	1,398	1,374	1,449	1,390	1,549	1,487	1,448	1,389

Notes: (1) Dependent variable equals 1 when a firm uses a financing channel and 0 otherwise. (2) Firm characteristics, macroeconomic indicators and firm fixed effects are controlled. (3) Dependent variables in Panels A to D are *Formal, Loan, Equity* and *Trade credit* respectively. (4) CHK, STPT and FN are used as indicators for zombie firms. (5) Specifications of odd numbers use sub sample of high financial development group while even numbers use sub sample of low financial development group. (6) All firm level variables are lagged by one period, robust standard errors in parentheses. (7) *, **, and *** indicate significance at the 10%, 5% and 1% level, respectively.

Table 8 reports the results of the baseline regressions using different subsamples. Panel A shows that the CHK zombies are less likely to obtain formal financing only in provinces with low financial development. Also, the FN zombies are discriminated more in regions where loan amount to GDP is lower. While FN zombies have difficulty accessing formal financing regardless of the development of stock market, this effect is more pronounced in provinces with lower stock capitalisation to GDP ratios.

Panel B shows that the STPT zombies find it difficult to access loan financing only in the lower financial development group. Similar to Panel A, when we use the loan to GDP ratio to measure financial development, FN zombies have a lower probability of obtaining loan financing in the lower financial development group.

Financial development exacerbates resource misallocation in the stock market as well. In provinces with lower financial development, CHK zombies have difficulties in issuing stocks. In contrast, this phenomenon no longer exists in the higher financially developed group. More importantly, STPT zombies are preferred in the stock market in regions with higher financial development, which indicates that resource misallocation is more severe in these places.

Panel D shows that the significance level of the CHK dummy for trade credits is higher in places with better financial development. FN zombies benefit from financial development as well. While they have smaller chances of receiving trade credits in regions with low financial development, they are not discriminated in places with abundant financial resources.

To summarise, zombie firms in financially developed provinces have a higher likelihood of obtaining external financing, i.e. both formal and informal financing. Financial development, by increasing the regional financial resources, escalates the chances of fund-raising for zombie firms and distorts the allocation of capital. Thus, financial development may lead to undesirable consequences with a widespread presence of zombie firms in the market, i.e. more financial resources are misallocated to zombie firms.

Stock value versus flow value

Our findings show that it is equity financing and trade credits that keep China's zombie firms alive (equity financing supports CHK zombies and trade credits help STPT zombies), while loans and the bond market are relative more efficient. This result contradicts a typical claim that the misallocation of bank credit supports China's zombie firms; it is often quite misleading as firms with poor performance usually have high leverage (e.g. Table 5 shows a positive correlation between leverage and STPT/FN zombie firms).

We argue that these seemingly inconsistent results reflect the difference between the balance of liability and the changes of liability. While our earlier analysis focussed on the changes, Table 9 uses the debt to asset ratio (liability/asset, stock value) as the dependent variables and captures the effect of the balance of leverage.

Table 9. Zombie firm and the debt to asset ratio.

	CHK	STPT	FN
	(1)	(2)	(3)
Zombie	-0.0261*** (0.0041)	0.0549*** (0.0099)	0.0686*** (0.0064)
Size	0.0017 (0.0058)	0.0112** (0.0054)	0.0043 (0.0058)
Tangibility	0.0944*** (0.0277)	0.1286*** (0.0259)	0.0911*** (0.0276)
Age	-0.0015 (0.0010)	-0.0003 (0.0009)	-0.0016* (0.0009)
Constant	0.4889*** (0.0380)	0.3690*** (0.0346)	0.4608*** (0.0376)
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Obs	16,090	19,966	15,928
R-squared	0.0116	0.0184	0.0218
No. of ticker	2,391	2,530	2,391

Notes: (1) Dependent variable is the debt to asset ratio (total liabilities / total assets). (2) Firm characteristics, macroeconomic indicators and firm fixed effects are controlled. (3) CHK, STPT and FN are used as indicators for zombie firms. (4) All firms level data is lagged by one period, robust standard errors in parentheses. (5) *, ** and *** indicate significance at the 10%, 5% and 1% level, respectively.

Columns (2) and (3) of Table 9 show that the debt to asset ratio of firms with poor performance (STPT and FN zombies) is indeed significantly higher. Poorly performing zombie firms often have high debt levels; while they have experienced a deleveraging process, as our baseline models show, they are less likely to receive new debt financing. Firms relying on subsidies (CHK zombies) have a lower balance of leverage in general.

Ex-post use of funds

In order to gain a better understanding of the misallocation of funds, we examine how zombie firms make use of the funds they obtain. We only focus on formal financing as a whole (loan, bond and equity financing) and informal financing (trade credit). The real investment ratio is the amount of expenditures on fixed asset minus cash inflows from disposal of fixed asset scaled by total asset⁶ (see Wu, Gyourko, and Deng 2015). The positive coefficients of external financing indicate that firms tend to increase their real investment after receiving external funds. More importantly, the negative interaction term indicates that CHK zombies' capital formation is less efficient than that by healthy firms.

⁶ We also use capital expenditure as a proxy for real investment; the results are very similar. However, missing data about capital expenditures is very common before 2005. Therefore, we do not report this set of results.

Table 10. Investment behaviours ex post obtaining external financing.

Panel A: Real investment	Formal			Trade credit		
	CHK	STPT	FN	CHK	STPT	FN
	(1)	(2)	(3)	(13)	(14)	(15)
Zombie	0.0042** (0.0017)	-0.0012 (0.0029)	-0.0199*** (0.0024)	0.0034** (0.0016)	-0.0041 (0.0029)	-0.0177*** (0.0023)
Amount	0.0790*** (0.0085)	0.0643*** (0.0075)	0.0674*** (0.0081)	0.0575*** (0.0095)	0.0457*** (0.0079)	0.0498*** (0.0084)
Amount * Zombie	-0.0404** (0.0168)	-0.0035 (0.0186)	0.0207 (0.0396)	-0.0415** (0.0169)	0.0127 (0.0205)	-0.0244 (0.0301)
Constant	0.0691*** (0.0022)	0.0699*** (0.0022)	0.0716*** (0.0022)	0.0689*** (0.0022)	0.0696*** (0.0022)	0.0711*** (0.0022)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Obs	15,565	18,176	15,429	15,249	17,820	15,094
R-squared	0.0437	0.0346	0.0489	0.0378	0.0314	0.0431
No. of ticker	2,352	2,406	2,352	2,338	2,391	2,338

Panel B: Financial investment	Formal			Trade credit		
	CHK	STPT	FN	CHK	STPT	FN
	(1)	(2)	(3)	(13)	(14)	(15)
Zombie	0.0013 (0.0013)	0.0012 (0.0019)	-0.0017 (0.0017)	0.0017 (0.0013)	0.0010 (0.0018)	-0.0018 (0.0016)
Amount	0.0116* (0.0059)	0.0090* (0.0051)	0.0120** (0.0054)	0.0048 (0.0077)	-0.0001 (0.0064)	0.0015 (0.0071)
Amount * Zombie	-0.0003 (0.0120)	0.0104 (0.0159)	-0.0134 (0.0196)	-0.0098 (0.0137)	0.0001 (0.0153)	0.0158 (0.0215)
Constant	0.0030* (0.0018)	0.0029 (0.0018)	0.0036** (0.0018)	0.0025 (0.0019)	0.0030 (0.0018)	0.0032* (0.0018)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Obs	14,604	17,160	14,486	14,320	16,823	14,184
R-squared	0.0076	0.0073	0.0076	0.0075	0.0072	0.0073
No. of ticker	2,351	2,406	2,351	2,338	2,391	2,338

Panel C: Distribution	Formal			Trade credit		
	CHK	STPT	FN	CHK	STPT	FN
	(1)	(2)	(3)	(13)	(14)	(15)
Zombie	-0.0002 (0.0004)	-0.0043*** (0.0006)	-0.0006 (0.0005)	-0.0002 (0.0004)	-0.0039*** (0.0006)	-0.0002 (0.0005)
Amount	0.0013 (0.0016)	-0.0008 (0.0014)	0.0012 (0.0015)	-0.0043** (0.0018)	-0.0050*** (0.0017)	-0.0031* (0.0018)
Amount * Zombie	0.0017 (0.0033)	0.0096** (0.0038)	0.0129* (0.0072)	0.0050 (0.0041)	0.0158*** (0.0042)	0.0026 (0.0075)
Constant	0.0255*** (0.0004)	0.0260*** (0.0004)	0.0255*** (0.0004)	0.0254*** (0.0004)	0.0260*** (0.0004)	0.0253*** (0.0004)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Obs	15,871	18,521	15,734	15,532	18,132	15,375
R-squared	0.0154	0.0237	0.0153	0.0157	0.0237	0.0149
No. of ticker	2,352	2,406	2,352	2,338	2,391	2,338

Panel D: Repayment	Formal			Trade credit		
	CHK	STPT	FN	CHK	STPT	FN
	(1)	(2)	(3)	(13)	(14)	(15)
Zombie	-0.0268*** (0.0038)	-0.0196*** (0.0067)	0.0542*** (0.0062)	-0.0261*** (0.0039)	-0.0160** (0.0066)	0.0545*** (0.0060)
Amount	-0.1629*** (0.0153)	-0.1530*** (0.0127)	-0.1443*** (0.0138)	-0.1005*** (0.0227)	-0.0884*** (0.0184)	-0.0766*** (0.0204)
Amount * Zombie	0.0590** (0.0292)	0.0664* (0.0363)	0.0202 (0.0778)	0.0998** (0.0443)	0.1563*** (0.0563)	0.0944 (0.0908)
Constant	0.2443*** (0.0050)	0.2300*** (0.0049)	0.2333*** (0.0048)	0.2468*** (0.0051)	0.2329*** (0.0050)	0.2360*** (0.0049)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Obs	15,807	18,405	15,670	15,470	18,018	15,314
R-squared	0.0290	0.0256	0.0346	0.0209	0.0179	0.0273
No. of ticker	2,351	2,406	2,351	2,337	2,391	2,337

Notes: (1) Dependent variables in Panel A to D are real investment, financial investment, distribution and debt repayment, respectively. (2) All dependent variables and financing channels are scaled by total assets. (3) CHK, STPT and FN are used as indicators for zombie firms. All firms level data is lagged by one period, robust standard errors in parentheses. (4) *, **

Financial investment is the cash payment for financial investment less cash received from reclaiming financial investment scaled by total asset. Panel B shows that while firms increase their financial investments after obtaining formal financing, they do not adjust their financial investment position after receiving trade credits. Also, zombie firms do not behave differently compared to healthy firms.

Panels C and D show firms' distributions (dividends, profit distributed or interest paid) and debt repayment behaviours after raising money. Compared to healthy firms, both the STPT and FN zombies distribute more funds after receiving external financing, which indicates a lack of investment opportunity or cream skimming. Also, both the CHK and STPT zombies spend more to repay their debt earlier, which suggests that these zombies are struggling to roll over their debts.

Robustness check

Whether a firm is zombie or not is affected by a series of factors, and the financing pattern alone is not sufficient to determine whether the firm stays healthy or becomes a zombie. Thus, the endogeneity concern is not severe in our model. Still, we address this issue by using propensity score matching (PSM) to test the treatment effect, following Rosenbaum and Rubin (1983).

We conduct the PSM in two stages. First, we predict the probability of each firm receiving treatment (i.e. becoming a zombie firm) for each firm-year observation based on the firm's characteristics using the Probit model. Next, we match observations with similar propensity scores within the same year-industry group and test the average treatment effect for the treated (ATT).

Hoshi (2008) shows that major determinants of zombie firms are firm size, leverage, profitability, and whether a firm is in a metropolitan area or not.⁷ We include these variables in the first stage regression analysis. Also, we introduce a dummy for state ownership, the GDP per capita, and the GDP growth of the province to control for regional factors. We also include industry, year and province fixed effects.

In the second stage regression analysis, every zombie firm ('treated') is paired with a set of non-zombie firms ('control') with a similar likelihood of becoming a zombie firm. We adopt three different matching methods, namely one-to-one matching, one-to-one matching with 0.1 caliper and 5-nearest neighbour matching. The balancing test results are shown in Appendix 3. The T-test shows that the mean difference between the treated and control groups for each variable in the first stage regression is not significant, which indicates that the matching process is appropriate.

This process serves as a quasi-natural experiment which compares zombie firms to non-zombie firms that have same probabilities of becoming zombies. The difference between the treated and control groups is only caused by whether a firm is a zombie or not. Table 11 shows that the propensity score matching results support our earlier findings. Specifically, zombie firms obtain less external financing. More importantly, CHK and STPT zombies still receive support from trade credit and equity financing, respectively. In contrast, it is difficult for FN zombies to obtain funds through any of the financing channels.

⁷ It is generally believed that Beijing, Shanghai, Guangzhou and Shenzhen are China's four major metropolitan areas (also known as the first-tier cities). So we construct a dummy variable equals to 1 if a firm is registered in the four cities, and 0 otherwise, and use it in the first stage regression analysis.

Table 11. Propensity score matching.

Matching algorithm	Outcome	CHK					STPT					FN					
		Treated	Controls	Difference	T-stat	Treated	Controls	Difference	T-stat	Treated	Controls	Difference	T-stat	Treated	Controls	Difference	T-stat
one to one matching	Formal	0.4421	0.4442	-0.0020	-0.15	0.3129	0.3424	-0.0295	-1.59	0.3319	0.4485	-0.1167***	-5.59	0.3319	0.4485	-0.1167***	-5.59
	Loan	0.3635	0.3490	0.0145	1.12	0.2440	0.2872	-0.0432**	-2.49	0.2530	0.3563	-0.1033***	-5.30	0.2530	0.3563	-0.1033***	-5.30
	Bond	0.0584	0.0584	-0.0024	-0.38	0.0024	0.0266	-0.0242***	-4.16	0.0252	0.0771	-0.0519***	-6.26	0.0252	0.0771	-0.0519***	-6.26
	Equity	0.0986	0.1263	-0.0277***	-3.12	0.1290	0.0738	0.0552***	4.23	0.1084	0.1008	0.0076	0.54	0.1084	0.1008	0.0076	0.54
	Trade credit	0.6192	0.5869	0.0324**	2.39	0.5098	0.5691	-0.0593***	-3.03	0.5011	0.5692	-0.0680***	-3.12	0.5011	0.5692	-0.0680***	-3.12
one to one matching with 0.1 caliper	Formal	0.4420	0.4447	-0.0027	-0.20	0.3187	0.3453	-0.0266	-1.43	0.3341	0.4506	-0.1165***	-5.54	0.3341	0.4506	-0.1165***	-5.54
	Loan	0.3639	0.3493	0.0146	1.13	0.2477	0.2894	-0.0417**	-2.40	0.2534	0.3572	-0.1038***	-5.29	0.2534	0.3572	-0.1038***	-5.29
	Bond	0.0555	0.0586	-0.0031	-0.49	0.0025	0.0269	-0.0244***	-4.27	0.0250	0.0778	-0.0528***	-6.35	0.0250	0.0778	-0.0528***	-6.35
	Equity	0.0989	0.1267	-0.0278***	-3.12	0.1336	0.0761	0.0575***	4.37	0.1125	0.1035	0.0090	0.63	0.1125	0.1035	0.0090	0.63
	Trade credit	0.6190	0.5873	0.0317**	2.35	0.5102	0.5702	-0.0600***	-3.05	0.5041	0.5677	-0.0637***	-2.90	0.5041	0.5677	-0.0637***	-2.90
5-nearest neighbour matching	Formal	0.4421	0.4509	-0.0087	-0.72	0.3129	0.3540	-0.0411***	-2.61	0.3319	0.4512	-0.1193***	-6.53	0.3319	0.4512	-0.1193***	-6.53
	Loan	0.3635	0.3577	0.0059	0.50	0.2440	0.2939	-0.0499***	-3.40	0.2530	0.3602	-0.1072***	-6.29	0.2530	0.3602	-0.1072***	-6.29
	Bond	0.0560	0.0637	-0.0077	-1.35	0.0024	0.0309	-0.0285***	-7.20	0.0252	0.0726	-0.0474***	-6.79	0.0252	0.0726	-0.0474***	-6.79
	Equity	0.0986	0.1253	-0.0267***	-3.46	0.1290	0.0817	0.0473***	4.26	0.1084	0.1018	0.0066	0.54	0.1084	0.1018	0.0066	0.54
	Trade credit	0.6192	0.5936	0.0256**	2.14	0.5098	0.5688	-0.0590***	-3.46	0.5011	0.5602	-0.0590***	-3.06	0.5011	0.5602	-0.0590***	-3.06

Notes: Every zombie firm is match to a non-zombie firm with the same likelihood of becoming a zombie within the same industry and year.

Conclusion

In this paper, we examine the financing patterns of China's zombie firms. We find that different types of zombie firms rely on different financing channels to survive. On the microeconomic level, we show that it is the equity market and informal financing (i.e. trade credits) that support China's zombie firms. Loan financing, on the contrary, is more efficient in allocating financial resources. Specifically, zombie firms supported by subsidies (i.e. CHK zombies) rely on trade credits, and the poorly-performing firms (i.e. STPT zombies) resort to equity financing to stay alive.

On the macroeconomic level, the evidence shows that the stimulus plan and financial development harm the allocation of funds by increasing accessibility to external financing for zombie firms. This not only reveals the undesirable consequences of governmental support, but also indicates that the structural deficiency cannot be solved by policies targeted at the aggregated level. Also, our study proposes a warning for Chinese economy that financial development can be harmful if the distortions, which may lead to a misallocation of financial resources, are not eliminated first.

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Appendix 1. Benchmark rates, floating range and minimum interest rate.

Year	Benchmark short	Benchmark long	Floating range	Minimum short	Minimum long
1999	5.58%	5.94%	[0.9,1.1]	5.02%	5.35%
2000	5.58%	5.94%	[0.9,1.1]	5.02%	5.35%
2001	5.58%	5.94%	[0.9,1.1]	5.02%	5.35%
2002	5.04%	5.49%	[0.9,1.1]	4.54%	4.94%
2003	5.04%	5.49%	[0.9,1.1]	4.54%	4.94%
2004	5.04%	5.49%	[0.9,+1]	4.54%	4.94%
2005	5.22%	5.76%	[0.9,+1]	4.70%	5.18%
2006	5.40%	6.03%	[0.9,+1]	4.86%	5.43%
2007	5.67%	6.57%	[0.9,+1]	5.10%	5.91%
2008	4.86%	5.40%	[0.9,+1]	4.37%	4.86%
2009	4.86%	5.40%	[0.9,+1]	4.37%	4.86%
2010	5.10%	5.60%	[0.9,+1]	4.59%	5.04%
2011	5.60%	6.45%	[0.9,+1]	5.04%	5.81%
2012	5.60%	6.15%	[0.7,+1]	3.92%	4.31%
2013	5.60%	6.15%	Not limited ⁸	3.92%	4.31%
2014	5.60%	6%	Not limited	3.92%	4.20%
2015	4.35%	4.75%	Not limited	3.05%	3.33%

Data source: PBOC from 1999 to 2015.

⁸ Thirty percent of maximum discount requirement was abolished since 2003. However, 70% of the benchmark interest rate is already low enough. In practice, it is quite rare to see interest rate below 70% of PBOC's benchmark. So we still set minimum interest rate at 0.7 * benchmark rate.

Appendix 2. Variable definitions.

	Variable	Definition
Financing tools	<i>Loan</i>	=1 if long-term loan increases by 5% or above, 0 otherwise
	<i>Bond</i>	=1 if a firm issues long-term bond, 0 otherwise
	<i>Equity</i>	=1 if a firm issues stocks, 0 otherwise
	<i>External</i>	=1 if a firm obtains loan, bond or equity financing, 0 otherwise
	<i>Trade credit</i>	=1 if trade credit (account payable, bill payable, advance from customers) increases by 5% or above, 0 otherwise
Zombie Indicators	<i>CHK</i>	=1 if a firm is a zombie firm using the CHK criterion, 0 otherwise
	<i>STPT</i>	=1 if a firm is a ST or PT firm, 0 otherwise
	<i>FN</i>	=1 if a firm is a zombie firm using the FN criterion, 0 otherwise
Firm characteristics and macroeconomic indicators	<i>Size</i>	Logarithm of the sales revenue
	<i>Leverage</i>	Total loan and bond / total assets
	<i>Tangibility</i>	Fixed assets / total assets
	<i>Age</i>	Number of years after the IPO
	<i>GDP growth</i>	Annual growth rate of GDP
	<i>M2</i>	M2
	<i>Stock return</i>	The annual return of composite index of Shanghai Stock Exchanges

Appendix 3. Balancing test for PSM.

		Treated	Control	Bias	T-stat
CHK	Size	7.4469	7.4273	1.5%	0.52
	Leverage	0.2081	0.2059	1.4%	0.52
	Profitability	7.3583	7.2078	1.0%	0.43
	Ownership	0.5310	0.5528	-4.4%	-1.61
	Metropolitans	0.3471	0.3507	-0.8%	-0.28
	GDP growth	0.1332	0.1319	2.2%	0.80
	M2 growth	0.1574	0.1570	1.1%	0.43
	Per capita GDP	10.6590	10.6650	-0.9%	-0.34
STPT	Size	6.7399	6.7970	-4.1%	-0.97
	Leverage	0.1911	0.2012	-6.2%	-1.45
	Profitability	1.6963	2.8674	-5.4%	-1.22
	Ownership	0.4287	0.4114	3.5%	0.85
	Metropolitans	0.2126	0.2110	0.4%	0.10
	GDP growth	0.1447	0.1434	2.2%	0.51
	M2 growth	0.1688	0.1687	0.4%	0.08
	Per capita GDP	10.4490	10.4590	-1.6%	-0.39
	Size	7.4158	7.5144	-7.6%	-1.57

	Leverage	0.2886	0.2863	1.4%	0.29
	Profitability	-3.9371	-3.2731	-3.6%	-0.66
	Ownership	0.5301	0.5073	4.6%	0.97
FN	Metropolitans	0.2500	0.2647	-3.3%	-0.71
	GDP growth	0.1251	0.1219	5.5%	1.18
	M2 growth	0.1549	0.1545	1.0%	0.20
	Per capita GDP	10.5550	10.6050	-7.9%	-1.64

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