

Digital latecomer economies and national internet policy: The case of China

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1. Introduction

With the expansion of the internet and the growing importance of digital data in all sectors of the economy, online platforms and services are becoming increasingly central to the operation and success of economies. We are also seeing a global expansion in the use of the internet, where global access has facilitated greater use in middle-income and emerging economies. However, the rapid expansion in global use of the internet has not been mirrored by a similar global expansion of locations of internet firms and platforms, which are predominantly globalised firms, originating and run from the US or EU.

With the sluggish emergence of local firms and localised services, a number of middle-income and emerging countries (we will refer to these as ‘digital latecomers’) have begun to institute national strategies and policy in order to protect or nurture digital firms, to support capacity, and build digital sectors. For instance, national internet filters define who can transmit to customers, trading rules define how international web firms must act before they can legitimately trade online and technology transfer rules outline ways firms must share data and integrate with local businesses.

Typically national policies related to the internet have been seen as the antithesis to ‘openness’ and dismissed as out of order. This has limited our knowledge on such national policy, and there is a risk of missing a rich set of policy making that is emerging on ground (Azmeh & Foster 2016). Whilst some elements of such policy have negative impacts, others can be more prudent. The goal then is to undertake an analysis of such policies to provide insights on useful policy that can aid digital development in latecomer economies.

In this paper we particularly focus on policy around platforms as a key point of contention and policy focus for ‘digital latecomers’ economies. Alongside the ability for businesses to rapidly expand internationally through platforms, it is well known that the properties of platforms have a tendency to move towards monopoly-like control and reduced mobility of customers (Farrell & Klemperer 2007). Thus, it comes as no surprise that platforms have been a particular focus of policy makers. As the ‘platform society’ emerges and platforms become increasingly central to economic success, we predict

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that it is likely that such policies will become more prevalent in the future.

We seek to unpack some of the layers of policy in order to build a wider understanding of platform growth. In order to do this we undertake case study research to explore a selection of Chinese platforms, and examine the links between policy and the direction of growth of platforms. We draw upon secondary reports, documents and interviews to explore firm histories and this material is supported by a systematic analysis of Chinese policy and strategies related to digital platforms.

China has instituted a particularly contentious set of national policies around the internet in recent years. These policies have attracted criticism in that they are closely entwined with censorship or dubbed as ‘digital protectionism’. Yet Chinese policy making needs to be taken seriously, policy has yielded startling success, and can be directly linked to the emergence of internet platform giants such as Alibaba, Baidu, Tencent, and Sina Weibo. Our approach (at least during analysis) is to seek to analyse this case without making ethical judgements that have plagued work on Chinese internet policy.

The remainder of this paper is set out as follows. In section two we explore the ways that national digital policy has been discussed to date, particularly the debates around national digital policy and digital protectionism. We then question this perspective particularly through lens of industrial policy literature which argues that successful development of Asian economies has historically emerged through active industrial policy. Thus, the development of successful digital sectors is likely to be closely entwined with an active and strategic state and thus we might need to reconsider digital policy.

In section three, we explore Chinese platforms in more detail. Analysis of this case suggests that Chinese policy in relation to platforms encompasses a far richer and varied set of activities than has been previously characterised. Notably we use a policy framework based on Mathews & Cho(2000) notion of “developmental resource leverage” and in the case of Chinese platforms we see that the state has particularly supported policy to accelerate knowledge and technology transfer. In section four we discuss how these finding might be relevant in other contexts. Chinese digital development is successful due to its very large markets of customers, muscular policies, and the increasingly granular filtering of the ‘great firewall’ to shield infant platforms in China. Thus, we highlight that whilst ‘resource leverage’ are relevant to digital development, further research will be needed to understand how viable these approaches will be outside the specificity of China’s state-led model.

2. Perspectives on national digital policy

2.1. Digital protectionism

Debates about the merits of the terms of trade have been debated for many decades (Stiglitz 2003). Free trade advocates have argued that opening up nations to international competition leads to vibrant

economies and ultimately economic development. Such perspectives are frequently countered by others who point out the history of damaging impacts of totally free trade and the success of state led approaches to development. For example, “Washington Consensus” approaches to opening and reforming economies of the 80’s and 90’s were often disastrous, hollowing out previous productive sectors whilst certain countries which ignored the advice they were given have dramatically grown. At the heart of these debates is the question as to the extent to which an economy should allow global competition or look to nurture and protect local sectors.

What is perhaps surprising is that when it comes to discussion of the internet, with its increasing centrality in trade and mediation of firm relationships, these debates are barely present (likely owing to the way that the internet has been articulated as a globally connected resource). These legitimate debates around how policy is used to maximised national gain are typically articulated as a battle between “open” and “closed” approaches to the internet where any type of national activity or policy beyond light touch regulation is seen as problematic.

Of course, there is very clear articulation of why digital trade should not be confined by national laws and policies. For instance, Meltzer (2015) summarises the key arguments for free trade online, based around the ability for international aggregation of markets. These can drive new modes of connection, innovation and new business models that are enabled through the global nature of the internet. National policy is seen as highly problematic and potentially impacting the role that internet and digital data plays in growth (Bauer et al. 2014).

With a lack of debate these views have become widespread, and has led to alignments between traditional global institutions that articulated free trade such as the World Bank (World Bank 2016) and activist groups which have positioned themselves as advocates of internet users such as the Internet Society, the WWW Foundation and the Electronic Frontier Foundation². This is highlighted for example in the recent Global Commission on Internet Governance, a commission made up of a curious mix of politicians, activists and internet architects. In their report entitled "One Internet" (GCIG 2016), it is difficult to disagree with their key refrain that "the network needs to remain open, allowing data to flow freely based upon the architectural principle of efficiency and non-discrimination" (ibid. p.v), however it becomes more problematic as they seek to associate an ever growing plethora of issues with either the “open” or “closed” mind-set in the areas of access, infrastructure data flows and fragmentation.

Beyond these broad-based discussions trade bodies, representatives and alliances have gone further,

² Where activist organisation do depart from the likes of global institution is in they see the resultant global policy making around the internet emerging. With activist organisations leaning towards the open forums and participatory governance (Aaronson 2016) as opposed to becoming part of stealth negotiations, global politics and global trade deals (Azmeah & Foster 2016).

seeking to reposition local policies around the internet as a new type of protectionism, aligning local policy with an opposition to free trade, to be stamped out at all costs. For larger economies such as the US or EU, the growth in policies around digital trade is potentially damaging to their economies. The US trade representative (USTR) for example have suggested that "foreign trade barriers are having discernible effects on U.S. digital trade. According to the Commission's econometric estimates, removing these barriers would increase the U.S. real GDP by an estimated \$16.7–\$41.4 billion" (USTR 2013 p.1). Thus, organisations such as the USTR are seeking to take more active approaches to these so-called barriers that reduce digital trade. The first step in this has been in the adoption of the so-called "Digital dozen"(USTR 2015) (later to be expanded to the Digital 2 Dozen (USTR 2016)) as a core set of criteria of digital trade policy.

Such drives for closing down “digital protectionism” have been particularly been supported by technology firms who have seen local policies as potential risks in terms of their future global expansion and profits (Azmeah & Foster 2016). Google has been at the forefront of lobbying to the US government on digital trade - "a confluence of trends has created a new international trade and business environment that calls for governments to ensure that the Internet remains open for global business" (Google 2010 p.2).

There has also been an expansion of lobbying and activity in this area from technology business alliances and associations. For instance, US technology think-tank ITIF (Information Technology & Innovation Foundation) have been publishing a list of the "Worst Innovation Mercantilism Policies" in recent years, a hall of shame which begins to single out specific countries (Cory 2016, Wein 2014, Wein & Ezell 2013). For instance, China has often been seen as one of the worst perpetrator of digital protectionism (Azmeah & Foster 2016). The “great firewall”, whilst often discussed in terms of censorship has been a particular target is recast as an economic protectionist policy (Chen 2015b, Johnson 2010), and potentially invalidating WTO rules on trade barriers (Liu 2010). Presumably these reports are an attempt to begin to align digital policies with the USTR Special 301 reports, which highlight nations which are breaking the global rules. Thus we might see a future where offending countries put under pressure as part of WTO dispute, trade negotiations and potentially other sanctions and retaliations.

Whilst not to discount arguments around international trade as invalid, we see the current direction of the discussion as problematic. Firstly, the lack of debate around national policy has led to a consensus with increasingly wide array of activities being associated with an “closed” approach to the internet. In these discussions there is virtually no discussion of smaller nations trying to improve and nurture their economies that have been at the heart of historic debates on free trade and as such the discussion is skewed. Secondly, and more dangerously, bodies in leading countries may seek to specifically identify,

punish and legislate against national policy using the notion of digital protectionism. Again, there may be areas where this is appropriate, but with a lack of debate there is potential for policies aligned to powerful nations and the economic interest of key firms, without thinking of the wider implications.

2.2. Industrial development and latecomer economies

a) Perspectives

A useful perspective to provide a more balanced reading of national digital policy is the literature around industrial development and latecomer economies. In its examination of the upgrading and growth of high technology sectors in Korea, Japan, China and Taiwan we can find many parallel discourses in this literature to the current discussion on digital development.

In a mirror of the discussion in the previous section, in the 90's the so-called East Asian miracle was often viewed with suspicion, "there is a lingering sense that these industries have used 'unfair' techniques" (Mathews & Cho 2000 p.xiv). However, as Mathews and Cho continue "...no-one invited these late comers to the party. They had to use extraordinary organisational and strategic innovation in order to seize a share of these lucrative markets. That they succeeded is a small miracle....there are abundant lessons to be learnt in the successes" (ibid.). In line with the goal of this paper, this literature is particularly valuable in that it digs more deeply into national policy arguing that it is a key tenet of national industrial development. Thus, by exploring in-depth studies of previous generations of technological development they offer frameworks to think more systematically about digital technology development and policy.

This work on industrial development particularly focusses two key concepts. The first is the idea of the "latecomer nation" (and later expanded to latecomer firms). In conventional economic analysis, being a latecomer is often problematized where certain nations fall behind the frontier with a lack of leading edge firms and skills. However, there are also advantages to being a latecomer to a high tech sector. The processes of research and development, innovation as well as building processes and markets for goods is a long and costly road (Hobday 1995). Further, leading nations with well-established industries may be path dependent based upon the existing firms, skills and institutions that lead to non-optimal industries (ibid.). Given the nature of globalisation and technologies, it is highly viable that latecomer nations might thus be able to adopt new technologies and build sectors without the expense of leading nations. Furthermore, being less restrained by histories of technological development and path dependency these might lead to new approaches and improvements.

Following on from the idea of latecomer nations is the second concept of "catch up", with a particular focus being the exploration of successful East Asian sectors to understand in more detail the activities, learning and processes that allows these nations to efficiently absorb technology and build industrial sectors. More economic accounts have traditionally discussed international transfer of skills and

technology through passive diffusion of technology and building comparative advantage based on natural endowments (e.g. labour costs, local resources) (Hunt & Morgan 1995). In contrast these accounts of East Asian depart from the economic ideas, arguing that successful states actively manage and seek to maximise the processes of technology transfer and learning in order to accelerate 'catch up' (Lall 1992, Mathews & Cho 2000). Indeed, some authors go further than this to argue for the importance of an active developmental state in guiding markets and planning growth of new sector (Henderson 2002).

Whatever the position, these two concepts (of latecomers and catch up) imply that there are strategic policy decisions that can be made (at least historically) that will allow latecomers to be nimble in selecting lucrative sectors and then in gaining new technology capabilities.

b) Development resource leverage

There are number of useful frameworks around latecomer nations and catch up that can be useful in systematically analysing the processes of catch up. The notion of developmental resource leverage is particularly useful in that specifies the key processes and goals of catch up (Mathews & Cho 2000). Developmental resource leverage is not about building competitive advantages in order to produce original goods, but rather maximising the processes of diffusion of technology, transfer of resources and learning (Freeman 1995, Freeman 1988, Hobday 1995, Kim 1997). The three 'L's' model (Mathews 2002) – linkage, learning and leverage - highlight the processes by which catch up occurs.

Linkage refers to how less skilled firms can develop through providing services for more advanced firms, often beginning from low value activities and then moving up. These partnerships serve as the key source of learning. Previous examples of this include outsourcing agreements, technology licencing and original equipment manufacturing (e.g. use of low value components which are used in other products) and it these linkages which have been the bedrock of skills development, movements of technologies and people in sectors such as electronics (Hobday 1995). These approaches are particularly viable as production becomes increasingly complex, where modularisation of goods and services provides latecomer nations with the ability to integrate into global networks (Sturgeon 2002)

Learning relates to how the skills and knowledge are best absorbed. Thus, policy makers need to think about appropriate capabilities, both in terms of using technologies but also how process and incrementally improvements might emerge (Hobday 1995). Processes of improvement and innovation can lead to upgrading in the role of latecomer firms in global networks over time (Gereffi et al. 2005).

Leverage refers to how the skills, technology and relationships are best maximised in latecomer nations, exploring how latecomers can strategically leverage these activities to allow them to move toward the technology frontier - be that skills, equipment, reputation or scale. In countries such as Korea and

Japan, this often related to large networks or government support policy that have supported, financed and technology and skills (Freeman 1988, Kim 1997).

In sum, the rich literature of industrial policy and latecomer nations, provides rich frameworks to understand the importance of national policy in high technology sectors and approaches by which these might lead to growth. The limitation of this work is that it has to date not been used to explore latecomers related to the digital sector. The internet and digital firms are rather different in their nature from the origins of such models. Thus, whilst such frameworks provide a useful approach to analysis of national digital policy, we will need to be careful as to how widely applicable these models are to digital latecomers.

3. China as a digital latecomer

In this section we detail the specific activities occurring as digital firms develop in China. This draws on both our analysis of the history of successful firms and an analysis of the previous policies of the government.

3.1. Approach

The analysis of Chinese digital firms draws on two sets of data. Firstly, the authors explored secondary material around the development of the Chinese digital sector. This drew on some limited scholarly material but also an extensive archive of business reports and interviews with key CEOs and commentators in the sector. It is from this that the skeleton of the five-stage model (see below) emerged. To understand policy more clearly we also undertook a systematic analysis of Chinese policy related to digital resources. As we will outline below, the sector has moved from more reactive policy making and informal agreements towards centrality of policy. We thus particularly focussed on more recent policy developments and the role they are playing, looking to link between the five-stage model and policy making³.

3.2. A five-stage model of digital development

From this work, we outline a five stage model derived from empirical analysis. This is set up as a heuristic which highlights some of the key elements of Chinese policy, and forms the basis for wider discussions in the section four. The five stages are introduced below followed by more lengthy discussion drawing on empirical analysis.

³ Future work might also look to expand on this work drawing more extensively on the fortunes of one or two firms, in particular, we have less clear evidence about the more informal policy making activities during the early days of Chinese digital development. However, we still argue that this work is insightful for policy and by following in a case study approaches of previous analysis of industrial policy our work can be seen as a compliment to this literature.

Early production of websites and digital platforms in China has centres around *cloning* of popular international websites for the growing local market. There follows a stage of *hyper-competition* where multiple clones and potentially foreign firms compete for dominance of the market. This hyper-competition phase is marked by rapid localisation of platforms, as these firms vie to ensure their platforms are most relevant for local users. In many cases as the market grows, the state begins to play a more central role. New rules are defined, and this leads to a reduction in foreign competitors and local firms. In China the end result of such policy has been *oligopoly* platforms with large user bases who tend to follow the policies defined by the state.

This is not the end of the story, and recent government guidance highlights two additional stages. One related to how oligopoly forms are becoming *platforms*, to expand the range and coverage of the internet in China. Thus oligopolies are guided and become de facto elements of national policy. A further suggested step in recent policy highlight that these platforms (and the platformized firms) are now beginning to compete outside the country as part of China's push towards *innovation and upgrading*.

a) Cloning

In most stories of successful digital firms in China, the beginnings start in what we shall call “cloning”, generic lookalike copies of well-known websites and web applications. Take for instance, Pony Ma now CEO of Chinese internet giant Tencent, who has been dubbed “the Cloner” (Epstein 2011). Ma began his journey in the late 90's cloning internet chat application ICQ to create QQ a popular online chat application that became the base for other services. His career has also included attempts to introduce clones of Facebook (Xiaonei, later sold as Renren), Twitter (Fanfou) and Groupon (Meituan) which achieved various levels of success. Cloning of popular networks is widespread in China and can be seen as a dominant way that Chinese digital firms emerge: YouTube has at various times seen clones in forms such as Youku, 56.com and Tudou; Twitter clones have been popular such as Fanfou, TaoTao and Zuosa. Some examples of cloned sites are shown in Figure 1.



Figure 1: Examples of clone sites - Xianai, Facebook clone (top left), Fanfou, Twitter clone (right), Youku, YouTube clone (bottom left)

The dominance of cloning emerges from a number of factors. Clearly, lower intellectual property enforcement alongside the comparative distance from US and EU markets (and disinterest in the early days) make cloning acceptable to both Chinese firms and the authorities. Moreover, much of the essential code that runs websites (such as HTML, CSS, JavaScript) tends to be available online to inspect. Even where code is less open, there are a plethora of open source frameworks and infrastructure available online that can allow similar functionality to quickly be brought online.

As digital technologies develop in future, the ability for Chinese firms to clone digital technology innovated elsewhere might become more problematic. With the growth of more closed technologies such as mobile applications, and the complex integration of embedded software within machines and on servers, cloning of these components may be more difficult. In this case, some rules are beginning

to be designed that push localisation of source code. For instance the 2014 "Guidelines on Promoting the use of secure and controllable technology in the Banking industry" (often called Guide 317) (CBPRC 2015) has been particularly controversial in this regard. The articulated goal of this policy is to enable security in the financial sector, but it also introduced strong clauses around localisation linked to 'unfettered use' clauses, source code requirements and localised suppliers. Consequently, this policy could also serve to localise knowledge around a wide array of banking technologies. Thus, as law firm KWM describes it in their policy analysis, these rules have a wider agenda around knowledge transfer.

"This policy is to indirectly support and encourage the development of related national enterprises, suppress foreign companies dominant position in the information technology area to promote the protection of China's information technology and information security development" (Chen 2015a)

Controversy with this law stemmed from the fact that the requirements might enable Chinese firms to get access to key functionality of important software such as ATM and banking software, and thus be able to locally imitate it. In this case, the law was far reaching enough that the outcry from Microsoft, IBM and their Chinese partners that has led to policy makers working to refine this draft. However, even when the revised regulation emerges, similar localisation rules are liable to still be somewhat prevalent.

b) Hypercompetition and localisation

As outlined in the previous section, the emergence of clones particularly of popular international websites is one of the key characteristics of Chinese internet in its early stages. Cloning is an attractive proposition for entrepreneurs in China given the potential size and spending power in the Chinese market and thus there has often been a mass of competing clones. Many popular international platforms do not have one or two but tens of clones and in the case of group buying platforms over 100 clones have been reported (Lu 2010).

With large numbers of clones, the early stage market in China has very high levels of competition. In some technologies there has also been additional competition from international firms. These international firms with their large spending power only add to the sense of high competition in markets. Firms such as Ebay, Google and Uber have looked to build on their success to attempt to push into Chinese markets. Thus, we see fierce early competition, as highlighted by some well documented battles between Google vs Baidu, Taobao vs Ebay/Eachnet, Didi vs Uber, Sina Weibo vs Tencent Weibo, Alipay vs TenPay. However even behind this competition it should be noted that there are often another handful of firms in each market who might grow given the appropriate conditions.

One outcome of this hypercompetitive market is a rapid change. Indeed, if websites can initially be described as clones, this is temporary and they rapidly integrate new features, innovations, language and

localisation. Examples of such adaptations in China include Tencent's integration of "red envelopes" into its platform, a feature which creates a virtual version of common gifting practices during Chinese New Year. This has been popular and become a key aspect of growing the Weixin/WeChat platform with reportedly a massive 8 billion red envelopes sent during the 2016 Chinese new year. Indeed, other competitors have adopted this approach (Clover 2016). Another example of an adaptation is Chinese ride service Didi, which not only allows car sharing in its platform but also shuttle vans and carpooling, appealing to a wider set of lower income user in China (Butt et al. n.d.).

The move from more generic to feature rich platforms occurs rapidly. Digital platforms tend to be highly malleable and thus rapid change is not a side issue, but at the core of their competitive advantage. Given the importance of user experience in digital and software, and that the majority of these websites and applications have primarily focused on Chinese the local market, Chinese firms can adapt their approaches based on their knowledge of national, regional and niche markets to grow. Thus, for each platform one can see a growing dynamism of market with different firms adapting and focusing on specific features, needs and niches. As outlined in the case of red envelope feature, often the most successful of these adaptations are themselves copied and these become a standard feature of the market.

Of all stages examined, it is this stage where the power of the state was least present. Here competition does not greatly depart from early stage online competition elsewhere. Provisos should be added to this statement though. Firstly, hyper-competition has tended to occur within certain limits (related to what the platforms were doing). As we outline in the next section where firms innovate into more contentious areas, such as social media, then the state may step in. Secondly, we need more evidence in this stage around the role of capital in these markets. Likely the power of Chinese firms partly emerges from state support, and particularly Chinese investment funds and banks in providing capital for them to survive and/or expand. This is an area that is more difficult to examine given the complex ownership and investment patterns of both successful Chinese firms and the many direct and indirect avenues of Chinese state funding. Thus, the state may still be playing an unseen role in this this stage.

c) Standardisation and orderly oligopolies

The move from a range of competing start-ups, to a smaller number of profit making companies is a well-known story in the development of markets worldwide. However, in the Chinese digital sector policy and government interaction plays a significant role on the nature of the firms that eventually succeed and the shape of these markets moving forward.

Why and how specific markets become more closely regulated is context specific in China. In the case of micro-blogging, the early market included the emergence of a number of clones and competition including TaoTao, Jiwai, Zuosa and Fanfou as well as Twitter. However, with the increase in

information being shared, the government perceived this as problematic. Following riots in the North-western city of Ürümqi, the government elected to block Twitter at the national level and suspended local microblogs (Sullivan 2012). Later Sina and Tencent, two companies with good links to the state would be allowed to launch their respective Weibo microblogging services, having agreed to implement checks and balanced around the types of information being shared and being amenable to suspending their services if requested (Caragliano 2013, Sullivan 2012, Yang 2012). In such as case, the state has taken up a very active role - blocking of international firms and specifying feature as a condition of their operation. Typically for the surviving firms, rules and requirements have been negotiated informally behind closed doors by well-connected firms and key state bodies (Wui 2011).

We may in the future see further examples where the state invokes informal agreements and uses web blocking to select winners and losers in a sector. However, as the size and range of sectors in the digital economy grows, it becomes more difficult to control and monitor informal agreements. Thus, there has been a dramatic growth in formal policy in recent years, typically in sectors where the government sees intervention as particularly crucial or fast growing. Internet finance and banking, cloud computing and digital transport sharing are three archetypical examples (MFPRC 2015, MTPRC 2016, SCPRC 2015f). Rather than specifically ban firms from operating, as in the case of social media, these rules tend to place strong conditions on firms in a sector. In internet finance, rules push local ownership not only for firms, but also local access to software, services and code used in financial applications as outlined in the previous section. The goal of cloud computing regulation as can be readily interpreted from the title - "Guiding Opinions for Promoting the Innovation and Development of Cloud Computing to Cultivate New Types of Information Industry Services" (ibid.). These rules strongly push local cloud computing platforms, but also supporting these platforms through pushing government use of these local vendors. In the case of digital transport services, recent interim rules push ride sharing firms to reduce their use of subsidies, and support only licencing of more experienced taxi drivers (MTPRC 2016). Whilst these are less overt in terms of their local support they can again be interpreted as guiding competition towards Chinese firms such as Didi over Uber.

Thus, policies that lead to more orderly markets can emerge in different ways – both as overt actions and more recently in policy. To date, the outcomes of these different approaches has led to broadly similar outcomes, a reduction of a market to a few larger local firms, with international firms leaving the market (whether through mergers, changed strategies or through blocking). In China we particularly see the emergence of oligopoly type competition in many sectors led by the so-called B.A.T (Baidu, Alibaba, Tencent) - three giant internet firms that control the largest resources in most sectors. These well-established firms, who have been looked at favourably by the state have grown, and are now very well resourced. As new digital sectors emerge these firms are able to take control by buying up or taking ownership of startups. Whilst these firms are private, they are trusted by the political

establishment and are willing to trade off the activities against incoming rules. Such outcomes in the digital sector should not be surprising as they align very closely to the notions of "Capitalism with Chinese Characteristics" and the state-private sector relationships outlined in previous discussion on China (Huang 2008).

d) Platformisation

In the previous sections we have argued that digital sector is increasingly controlled by a set of oligopolies, which whilst independent and competing are liable to work with and follow guidance of the state. Thus we should ask how the state intends to guide these firms in the future. At this point our examination moves to very contemporary rules and future policies, drawing on policy plans and policy guidance to understand how these sectors might be shaped in the future.

What is clear from a reading these policy plans is that guidance by the state in the future is closely linked to overarching strategic plans for the country. The overarching 12th five year plan (SCPRC 2011) calls for Chinese firms to become more innovative and to upgrade, facilitating a move into competing based on innovation in global markets. Thus two particular and somewhat overlapping direction emerge in digital platforms. Firstly, moves to open up online and digital resources to a wider set of firms in China (which we discuss in this section). Secondly a wider ambition for Chinese firms to begin to compete in global markets (outlined in the next section).

If China has traditionally been perceived as competing based upon lower capital and labour costs, key strategic plans are looking to change this. The internet and digital resources are articulated to be a key driver in these plans, particularly the overarching "Internet plus" approach (Keqiang 2015) that sees the internet and digital networks as central to this modernisation of industry. As outlined by Li Keqiang, the current premier of the State Council

"We will develop the "Internet Plus" action plan to integrate mobile Internet, cloud computing big data, and the Internet of Things with modern manufacturing, to encourage the healthy development of e-commerce, industrial networks, and Internet banking" (ibid.)

Specific policies provide more detail. "Made in China 2025", focuses on the integration between production and digital technologies to ensure quality and rapid monitoring (so called Industry 4.0) (SCPRC 2015d). Elsewhere policy are being initiated that includes a focus on modernising SME, "Offline to online" (O2O) policies seek to support retail focussed firms in moving resources and payment online to support modernisation (SCPRC 2015b), and further initiative look to support the building of new online resources for small firms in areas such as marketing and promotion (SCPRC 2016b).

In sum, an ambition for modernisation and digital supported upgrading comes through active process

of "platformisation". Oligopoly digital firms work with the state to enable these firms to use the Chinese digital services. The rules turn these firms into an arm of state activity where these quasi-state platforms become a drive for wider development (of car drivers, good producers, retailers, factories). To what extent this drive leads to mass-adoption of these platforms and the ability of the state to secure a fair deal for users of these platforms remains to be seen, but clearly there is an integrated strategy here.

e) Expansion into global markets

A second focus of the 12th five year plan, is that as a consequence of modernisation and improved competitiveness, that Chinese firms would actively compete in international markets (SCPRC 2011). Again this aligns both with the 12 five year plan and the much publicised "One belt, one road" initiative that outlines the geography of a new economic corridor for China stretching through Asia and into Europe. This has served as a template for infrastructure support and areas of enhanced trade agreements (NDRC 2015)

Again digital policy is seen as playing a key role in supporting a more global focus. For instance, recent rules have started to support an expansion of intellectual property activity for Chinese firms including digital firms, to overcome a barrier that China has come up against as they have looked to compete globally (SCPRC 2015a). Similarly rules on innovation-driven development and free trade areas (SCPRC 2016a, SCPRC 2015e) support better integration of digital manufacturing firms within global production networks, and begin to allow a wider range of international investments into Chinese firms, particularly those in free trade areas and shared Chinese/international R&D facilities (SCPRC 2016a, SCPRC 2015e). Such policy focus also looks to further the exporting activities of emerging SME (SCPRC 2015c) with support for activities such as international warehouses and improving the ability of such firms to finance their activities as they act across borders. It will be interesting to see how effective such policies can be in enabling Chinese digital firms to be able to be more innovative actors in global markets in the future.

3.3. Summary

To summarise, the goal of this section was to provide an outline of the key policy activity by exploring the evolution of the Chinese digital sector. We outlined five stages - cloning, hyper-competition and localisation, oligopolisation, platformization and global expansion. Policy plays an important role in four of these stages, and in each there is different emphasis on the key players, actors and forms of policy. Thus it is clear that the range and focus of Chinese policy around the digital sector moves beyond rather narrow explanations of digital protectionism outlined in the literature reviews. In the next section, we will now move to explore what we can take away from this case for other latecomer economies, referring back to the previous industrial development frameworks.

4. Policy Lessons for digital latecomers

The previous section has outlined some of the stages related to the growth of the Chinese digital sector. In order to move towards our goal of to think more generally about local policy and digital economies, we return to the three 'L's' framework to discuss policy, and how findings from China might apply more generally. An outline of this model from the literature review is presented in Table 1 and discussed in more detail below

	Linkages	Leverage	Learning
Explanation	<i>What are the ways that latecomer firms are able to link into more advanced firms in order to gain the ability to use advanced technology</i>	<i>How do states ensure that this technology is leveraged to maximise use</i>	<i>What are the types of learning process that enable skills to be efficient to operate and innovate technology</i>
Diffusion/comparative advantage perspective	FDI, diffusion of innovations based upon comparative advantage	Low/Passive - Business support, support FDI, supporting specific skills training	Learning-by-doing
Developmental resource leverage	Actively build linkages into value chains, OEM production	Coherent business based networks, specific focus on sectors to exploit, certain levels of infant industry protection	Imitation, reverse engineering, partnerships, incremental innovation to wider innovation
Digital policy	Cloning, Focus on local markets where understanding is clear, Diffusion of foreign technology	Coherent (often fractious) strategy to allow leverage through policy - localisation and sovereignty rules, indirect infant industry protection, guiding dominant services to become platform	Imitation, Micro-innovation under hyper-competition, government promotion

Table 1: Three 'L's' model of learning and industrial development linked to previous paradigms of industrial development and local digital policy

4.1. General approach

We can say that in Chinese there is a clear focus on building digital resources for local users, firms and customers. China owing to its large population and its growing number of internet users is well set up to facilitate the growth of local companies, and for them to be able to rapidly grow, receive capital support and/or become profitable. This is a model which whilst often followed by firms in other digital latecomer countries is not always the norm. For instance, in digital latecomer Kenya, early policy focussed on digital firms moving rapidly into the international market and the high value customers (Graham & Mann 2013).

Thus, it should be emphasised that local digital markets are likely to be a key focus of infant industries

in digital latecomer countries⁴. Firms can draw on their knowledge of local users, institutions, and marketing and the local rules and regulations and it is here that local firms are likely to be able to compete with international firms, particularly if international firms draw on quite generic globalised policies. Thus, we would suggest that national digital policies should mirror this goal with a dominant focus on nurturing local markets over promoting international entrance.

4.2. Learning

The role of imitation as part of technology catch up has always been a key part of the latecomer path to innovation. For local early adopters of digital platforms, imitation of well-known digital sites can allow easier adoption for users. It allows new online resources, services and apps to be easily navigable and usable without much thought. In a sense, this highlights the advantages of "catch up" that latecomer models have discussed - the idea that latecomer digital firms can avoid much of the difficult demands, cost and research in producing an innovative online service or firm (Mathews 2002).

Historically, in other industrial sectors the learning and active use of imported technology has been a long and difficult process requiring much state support. Freedman (1987) for instance documents the case of Japan, technology assimilation and improvement came from the linkages, and then the importation of foreign technologies. This was followed by a long process of reverse engineering (actively supported by the state) in order to understand and localise foreign technologies (Mathews & Cho 2000). The digital sector can be seen as more viable than other sectors for imitation. Much of the source code already open to provide guidance, and with open source software and frameworks already available it is likely that with a small team of technically skilled programmers, production of a clone is possible.

Thus, in terms of learning, whilst there is still need for a heavy learning curve in terms of setting up and adopting technology, such activity is viable for a small team of well-educated entrepreneurs. As the Chinese case has shown, successful companies come from educated entrepreneurs and computer scientists who look to build new opportunities. Using well established software, templates and paradigms reduces the amount of time devoted to refining these sites in early operation. Thus firms can rapidly move from imitation to concentrate on localisation and small-scale innovation of these software and platforms. As has been illustrated in the Chinese case study, firms can draw on their knowledge of markets and user needs, language and with knowledge of software they should be able to quickly adapt software according to users' needs. In essence the more generic software becomes more feature rich and valuable. Thus, local web resources can potentially compete with international ones given the right focus and a move towards localisation.

⁴ It is worth adding that in some cases, local markets may be limited for instance in smaller nations with lower internet adoption, it may be important to rapidly expand

4.3. Linkage

As we outlined in the literature review, in previous industrial development literature, the state supported active building of links, consequently knowledge acquisition emerged through imported technology and linkages into global networks. It should be noted that in the case of China the role of policy in building linkages that would enable these processes of learning was minimal in some sectors but growing on others.

In some sectors such as core e-commerce and simple online platforms policy makers have mainly left the learning to naturally diffuse. This approach works with the current generation of digital platforms owing to the openness of digital technologies and availability of open source software and frameworks outlined previous. At most, policy here can support the demand side, as a larger more willing market of internet users and e-commerce transactors is liable to support higher levels of competition and push processes of adoption and localisation previously outlined.

Our Chinese case study, however, particularly focusses on the emergence of large companies during the early days of the web. It is true to say that technologies are changing and it may be that in a world of multiple-platforms (mobile, PC) and with the growth of data the complexities of new software reduce linkage through more passive diffusion. As shown in the case of China, policies have begun to support learning more actively through muscular policy which seeks to induce linkages. In China this include rules on the way that international firms locate software, data centres and key data locally and in some key sectors required sharing of source code. These policies support linkages by facilitating local developers in working with cutting edge technology or even being able to access the software code. This pushes up the likelihood that there is technology transfer and learning amongst local firms. However, as we have discussed elsewhere some elements of this approach have been highly controversial. For example, such requirements about software and source code are only viable in a country such as China with an attractive market, and its powerful state.

Given the level of openness in the software and web community, we suggest that even in the future as software and service become complex there is still extremely strong potential for learning, drawing on open resources available. Thus, one focus on national digital policy should focus on building networks and spaces for active learning and sharing. However, it may be that in key sectors policy makers become more active. Whilst the China case is not transferable there is likely to still be directions by which policy makers can encourage new linkages to allow local learning of digital software. For instance, with software the role of consultants can be important for guidance and thus active use of such actors can aid knowledge. By specifying key technologies within local standards government can also guide learning through linkages, particularly where standards adherence supports new business opportunities. Government can also support softer forms of localisation by making it attractive for firms to use local

or regional data centres, and this can lead to enhanced linkages and learning.

4.4. Leverage

China's approach to leveraging technologies consists of a range of activities to ensure that the learning and use of new technologies leads to the largest developmental impacts.

Previous resource leverage models, suggested that so-call infant industry protection was often present where the state decides *ex-ante* pm strategic sectors where local firms are protected from competition. In the Chinese digital sector we might describe government activity as "junior industry" protection. Given the speed of development of digital platforms, it was not possible for the state to guide very young industries or remove international competitors. Besides, competition and international entrance actually played a useful role in supporting competition and localisation. Junior industry protection is more emergent. As sectors grow and are perceived to be of strategic importance, the state takes an active role in limiting international firms.

Again some the policy approaches found were very unique to the operation of the Chinese state. Controversial policies such as blocking international firms and actively allowing Chinese firms to become dominant are neither viable nor desirable elsewhere. We can, however, still take away some insight away from the Chinese case that can be of benefit to digital latecomers. Firstly, the adapted idea of "junior industries" highlights the key stage where local digital sectors require the greatest support. The process in moving from a viable website, service or application to a scaled and profitable one is still the greatest challenge and it is at this stage that policy should look to support local firms. The importance of junior industries support also highlights that in a fast moving digital sector that it will not always be possible to follow the ebbs-and-flows of digital trends, rather policy makers will need to select those which are moving to become strategically important within a country. The Chinese examples of more indirect junior industry support highlight potential direction for policy makers. Policy support such as local demonstrators, government procurement and encouragement of use of services can support the emergence of local firms.

However, it is at this point where the model for digital development necessarily goes beyond that of the previous resource leverage model. Supporting digital sectors is much more than building a competitive sector. The goal of digital development should be to use the internet, digital software and services to transform the entire economy. Thus, as in the Chinese case, the end goal of this junior industry protection is a pliable set of firms with advanced software and skills which could become core to future strategies - as platforms for the digitalisation of smaller firms, the upgrading of industry, and later in supporting firms in global markets. For other digital latecomers, the Chinese case highlights that for leverage, the eventual developmental goals should orientate digital policy. Notably, the idea of policy that uses present digital firms as platforms for wider development is an ambitious goal that can allow

latecomers to more widely leverages digital gains.

5. Conclusion

To conclude we look to summarise the key policy outcomes to provide coherent insight. As we have outlined, the basis for this insight is questioning the idea that national policy is irrelevant to the digital sector, or that all policy should be seen as digital protectionism. Whilst in the Chinese case we certainly see cases of problematic policy making that will not be desirable or viable elsewhere, we also see examples of activity and direction that can be relevant to other digital latecomers.

The basis for our policy model is the ideas drawn from the wider literature on industrial development in latecomer economies and the role for policy. In particular for this paper we have used the idea of "developmental resource leverage" as a key model to conceptualise the important role that policy plays in accelerating technology transfer through supporting learning, linkage and leverage.

Given the unique aspects of each economy it is problematic to suggest a blueprint of policies, and indeed more in-depth research in latecomer economies will be required to build a clearer picture of policy and practises. Our examination of Chinese policy however allows us to suggest what the key goal of policy should be in these three domains and this is done in Table 2. Drawing on this case we also highlight some more specific suggestion of policy instruments which might be viable as examples of this policy goal.

Focus	Policy Suggestions
Learning	<i>Facilitating learning</i> • Spaces and forum for sharing skills • Facilitating demand in markets • Enabling competition
Linkage	<i>Ensuring linkages for complex software</i> • Consultants • Standards and specifying technologies linked to business opportunities • Soft localisation via support for reliable data infrastructure locally (e.g data centres)
Leverage	<i>"Junior industry support"</i> • Demonstrators, • Government partnerships and procurement, <i>Wider goals of leverage</i> • Platformization to leverage digital into wider economy • Rules to ensure maximal benefits of platformization locally

Table 2: Policy framework for latecomer firms in the digital sector

Due to the higher openness in the digital sector and software, learning is more viable in digital sectors without strong guidance. Thus key policy activities should revolve around support how this learning is

shared, facilitating demand in markets and enabling competition. For more complex software, more active policy that facilitate the linkages of firms is useful. We have outlined consultants, standards and softer policies of localisation via support for reliable data infrastructure locally as examples of potential policies. Leveraging these skills and linkages to the maximum will emerge from support for so-called "junior industries" where focus is on key sector that have emerged to become important rather than a catch-all approach. Here policies around demonstrators, government partnerships and procurement to promote new technologies and support the scaling of local firms are viable approaches. Ultimately for digital sector though, the eventual goals of leverage will be wider digitisation and improvement of production rather than the idea of a narrow sector. Thus, supporting promoting equitable platformization to leverage digital resources into the wider economy and policies that might support this are crucial.

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