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Asian Data Capitalism: An inquiry into economic integration in Asia Pacific 4.0

Student: Florian Paulsen (包弗洛)

Advisor: Chuang Yih-Chyi (莊奕琦)

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論文題目

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研究生：包弗洛　　Student: Florian Paulsen

指導教授：莊奕琦　　Advisor: Chuang Yih-Chyi

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Abstract

This research proposes the term ‘Asian data capitalism’ as a concept to conceive the role of data as a trans-boundary resource in the nascent digital ecosystems in Asia Pacific 4.0 in order to find out whether it can be considered as a potentially new and regionally indigenous variety of capitalism (VoC). This research applies an exploratory qualitative approach through policy review and analysis with particular regard to artificial intelligence and data privacy protection. I rely on a simple definition model of economic integration. Findings include that digital policies about AI and data security enhance negative regional integration through the removal of restrictions on the movement of digital goods, services, and personal information. However, a lack of policy coordination and international common standards entails a) regulatory heterogeneity and b) forgone opportunities to fully leverage nascent ecosystems. However, convergence towards policy models with principles pertaining to advanced data-handling frameworks such as the GDPR and APEC Privacy Framework can be expected in the Asia Pacific since they intersect largely with each other and point towards the evolution of global standards in data protection that promote the cross-border flow of data and digital goods. Nonetheless, the rapid proliferation of ICT and AI systems calls for closer attention to streamlining policies, with particular regard to ASEAN’s emerging member states and their integration into digital networks.

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List of abbreviations

AI	Artificial intelligence
AIoT	fusion word: artificial intelligence (AI) + Internet of Things (IoT)
AEM	ASEAN Economic Ministers
APEC	Asia-Pacific Economic Cooperation
ASEAN	Association of Southeast Asian Nations
CLMV	Cambodia, Lao, Myanmar, Vietnam
CPTPP	Comprehensive and Progressive Agreement for Trans-Pacific Partnership
GDPR	General Data Protection Regulation (European Union)
IMDA	Infocomm Media Development Authority (Singapore)
IIoT	Industrial Internet of things
IoT	Internet of things
MIIT	Ministry of Industry and Information Technology (China)
MOIS	Ministry of Interior and Safety (South Korea)
MOST	Ministry of Science and Technology (China)
NRF	National Research Foundation (Singapore)
OECD	Organisation for Economic Co-operation and Development
PIPA	Personal Information Protection Act (South Korea)
RCEP	The Regional Comprehensive Economic Partnership
SCP	Singapore Cooperation Program
SNDGO	The Smart Nation and Digital Government Office (Singapore)
STI	Science, technology and innovation
VoC	Varieties of capitalism
WTO	World Trade Organization

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Chapter 1. Introduction

1.1 Introduction

Throughout the capitalist era, technological advancements have undoubtedly propelled new ways of economic growth alongside social improvements (Li & Piachaud, 2018). Around the globe, the capitalist mode of production has tremendously increased peoples' wealth and well-being, mostly with the West dominating global production chains and steering development through innovation and adding-value for most of the time. However, natural resource-based growth is not infinite and technological gaps are still persistent, but the East Asian miracle and fast-paced catching-up in the rest of Asia showed that adequate development policies can bring prosperity, freedom and social benefits to an ever-larger number of people in a globalizing world (Lee & Shin, 2018; Lin, 2012; Ozawa, Castello, & Phillips, 2001; Wong, 2011). As a hot topic of the 21st century, the nascent concepts of the digital economy and industry 4.0 give rise to data being a new promising resource for future economic activity to foster wealth (Srnicek, 2016). With artificial intelligence (AI) underway to change business models, the economic world order is changing with new AI superpowers such as China firmly establishing themselves beside Silicon Valley and the West (Lee, 2018). The emerging Internet of things (IoT) is already giving scope cyber-physical spaces and diversifying consumer markets that connect people and devices globally as well as regionally in the Asia-Pacific. Smart factories running on the industrial internet of thing (IIot) spawn innovative and sustainable goods and services to be traded on newly emerging online platforms. The economic future may hence lie in 'value-added Asia' rather than 'factory Asia' (Kam, 2017). The question arises as to whether governments in the region will reconsider and rely on their previous catch-up experience steered by capable technocrats, or if they are able to introduce the right policies targeting data as a source of new growth models with special regard to its leapfrogging potential for latecomers and emerging startup ecosystems and markets in Southeast Asia (Chitturu, Lin, Sneader, Tonby, & Woetzel, 2017; Kam, 2017; Khanna, 2019; Li, 2018). This thesis sheds light on the socio-economic transformation towards a digital Asia Pacific 4.0 in an attempt to test the existence of a distinct regional pathway towards digital connectivity and economic integration. Throughout that process, data stands at the core of big data applications,

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and there are issues specifically arising around data-handling and the treatment of personal data. This often leads to issues such as the emergence of regulatory grey zones with regard to the categorization of data into personal and public data, the cross-border flow of the latter due to globalization of business operations, and the necessity for revisions of domestic conditions around the public or commercial use of big data including personal data (Mashiko, 2020). With particularly the latter being a source of competitiveness for companies, the necessity for arranging the conditions of commercial use of personal data, its limits, and the initial question of "who owns data and on which legal grounds?" spark concerns and legal risks to be dealt with for the sake of predictable business operations and stable growth strategies in the digital era. Therefore, this thesis emphasizes the policy dimension as a steering mechanism addressing issues of data-handling and treatment in a number of economies in the Asia-Pacific and their governments.

1.2 Terminology

I propose the term 'Asia Pacific 4.0' as a geo-economic construct that denotes the cyber-physical economic integration in the region towards the digital economy, from "Factory Asia" to "Value-added Asia" (Kam, 2017). The definition of industry 4.0 given by Kuo, Shyu, and Ding (2019, p. 5) helps to clarify the underlying rationale of Asia Pacific 4.0 in this thesis:

> (…) 4.0 [denotes] a System of Systems (SoS) which covers a number of interactive subsystems; it's the interactive mode of which forms a whole giant system. Industry 4.0 is not a single industrial plant, but the structure of the industrial chain. Different from the traditional industrial chain, Industry 4.0 is the ecosystem after industry integration and fusion. (p. 5)

Mostly referring to manufacturing around IoT and IIoT, the authors add that industry 4.0 currently will forge emerging industries, such as cloud and edge computing, 3D printing (additive manufacturing) with biological materials for instance, or augmented reality for real-time operations management, etc. (Kuo et al., 2019; Schroeder, 2016; Wong, 2011). This thesis aims to stretch the term of industry 4.0 and go beyond manufacturing by incorporating the role of data as a driver of socioeconomic subsystems within the SoS. Therefore, I aim to grasp a better understanding of how governments leverage the potential of the digital economy to reconfigure intra-regional networks in the Asia Pacific through data utility and big data analytics to a)

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allow businesses to streamline and innovate production processes in order to b) respond fast and effectively to changing market demands, and c) address the social impact by steering the transformation through adequate policymaking.

I propose the term 'Asian data capitalism' as a concept to conceive the role of data as a trans-boundary resource in the nascent digital economic ecosystems in Asia-Pacific 4.0. in order to distinguish it from the West as a potentially new and indigenous "variety of capitalism" (hereafter VoC, taxonomy of capitalist models by Hall and Soskice [2001], see section 1.3.3.2). Asian data capitalism shall reflect the data-derived value created for goods, services, and society as a whole in emerging "Value-added Asia" as opposed to former "Factory Asia" (Kam, 2017). The question arises as to whether the 4th industrial revolution, with data-driven applications at its core, can induce a structural shift that supersedes traditional flying geese patterns of labor-intensive jobs being outsourced to low-income countries (Hartley, Woo, & Chung, 2018). My assumption of a distinct form of Asian data capitalism derives from considerable scholarly attention not only to the rise of China but particularly to the Asian century itself, as suggested by Parag Khanna (2019) in *The future is Asian*, and implied by the dean of the Lee Kuan Yew School of Public Policy Kishore Mahbubani (2009) who amongst others predicts intra-Asian trade to surpass that of other regions by far in a few decades. One could argue that the underlying reason for Asian data capitalism to be a distinct form of capitalism encompasses all of the aforementioned facts: a) reshuffling of regional and global supply and production chains in the industry 4.0, b) leading to economic integration in that Asia's share in intra-regional trade will soar, supported by c) the exponential expansion of disrupting technologies such as AI, IoT, IIoT and their technological fusion.

1.3 Research outline

1.3.1 Motivation and contribution

Research in this field is scarce and scholarship calls for intensified theoretical development to describe, interpret and explain the transformation towards knowledge-based economic growth in Asia (Asian Development Bank Institute, 2014; Jones & Ström, 2018). Carney, Gedajlovic, and Yang (2009) find that research should focus on the diversity of capitalist models emerging in the region. Jones and Ström (2018) also advocate for overcoming undifferentiated stereotypes of Asian capitalism when plural

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forms truly exist. Moreover, questions about where Asia-Pacific is headed are posed by Gill, Huang, and Kharas (2007, Introduction, p. 5) who wonder if production-sharing networks will still propel growth and trade in the region. They also ponder on whether a shift from market-based development patterns to new forms of politically driven regionalism can successfully occur. I address this issue through the science, technology and innovation (STI) lens because economic activity has its core to generate wealth and welfare for a people to thrive as a society free of substantial burdens, thus, the economy and technological advance occur under sociopolitical aspects and legal frameworks, such as intellectual property rights or trade agreements, steered through policies by representatives (Langdon & Job, 1997). This is in order to scrutinize the extent to which efforts in policymaking are made in the political and economic realm to ultimately prove or contest Asian data capitalism as a distinct regional variety of capitalism.

Using an interdisciplinary approach, the objective of the study is not only to provide a comprehensive review of the literature but to add to the understanding of the value of data for Asia-Pacific in a regional as well as an international context and how the socio-economic value of data is addressed by governments through their respective policy roadmaps for the years to come. The study has the following sub-objectives:

> a) provide a review of data characteristics and highlight their idiosyncratic utility and economic value in Asian contexts,
> b) scrutinize governments' policy tools in addressing domestic key issues arising around the digitalization of economies (liberalizing or restricting firms and institutions in accessing, collecting, and using public and private data as a driver of growth and economic momentum)
> c) take into account the technology gap –also called the digital divide– between industrialized high-income and industrializing low-income countries of the Asia-Pacific (East Asia, Southeast Asia, and China in between) in order to test whether data capitalism marks the beginning of a new economic paradigm for economic development in the Asia Pacific.

The last sub-objective was greatly informed by Rodrik (2015) who delivers empirical evidence that countries that industrialized after 1990 reach peak employment shares in the manufacturing sector at around a third of the income compared to pre-1990 industrializing economies. Since data comes as a resource at low transaction cost with leapfrogging potential for 'latecomers', it could be conjectured that emerging markets in the Asia Pacific move towards "premature deindustrialization" (Rodrik, 2015) and,

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thus, deviate from traditional catching-up trajectories of their predecessors in the Asia Pacific, also known as the newly industrializing economies (NIEs). The digital economy could render a capital-intensive catch-up experience obsolete in that emerging economies release labor into the tertiary sector at smaller incomes and lower contributions of the manufacturing sector to GDP to an extent that has the potential to shift the conventional economic wisdom, such as the flying geese paradigm in an Asian context.

Apart from my personal interest in this vast topic of artificial intelligence and algorithms that will undoubtedly dominate the 21st century, I went to several relevant sites to talk to experts and museums as contact zones with my topic to grasp a better understanding of my research topic. A visit to Tokyo's Miraikan National Museum of Emerging Science and Innovation (日本科学未来館) in July 2019 taught me about emerging spatial information science targeting a people-centered affluent society through big data analytics, and affective engineering for a customized and personalized design. On a trip to Seoul, South Korea (hereafter Korea) in August 2019, I went to see Samsung Electronics' interactive showroom (Samsung D'light, 삼성 딜라이트) exhibiting upcoming technologies and R&D projects of the country's largest *chaebol*. Moreover, research by Holroyd (2019) and Cohen (2013) had sparked my interest in Korea's first creative cluster called Digital Media City, a visit to the site and talking to people from creative industries provided me with valuable insight. In August 2019, the Taiwan Automation Intelligence and Robot Show (台灣機器人與智慧自動化展) with the 2019 TAIROS International Forum (5G x Smart Manufacturing Forum) at Nangang Exhibition Center allowed me to speak to business representatives not only about their products but also about their perceived chances and obstacles on Asian and global markets regarding the commercialization of data-derived applications and AI technologies. Relevant experiences from the field trips will be set forth in the adequate parts of the thesis, respectively.

1.3.2 Guiding questions

Collecting and analyzing vast amounts of data is successively becoming easier through ICT advancements and exponentially opening up new fields of applications that often cannot be foreseen by policy-makers at the time of formulating related laws and regulations. This often leads to issues such as the emergence of regulatory grey

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zones with regard to the categorization of data into personal and public data, the cross-border flow of the latter due to globalization of business operations, and the necessity for revisions of domestic conditions around the public or commercial use of big data, with particular regard to personal data (Mashiko, 2020). Therefore, questions around institutional and regulatory environments addressed in this research include:

- Which policies do governments set out regarding the digital transformation? Are they country-specific depending on conditional economic factors, different from the West and distinct to the Asia Pacific, or do they tend to be global and formulated in a similar fashion?
- Must the value of data as a resource be protected through government restrictions and protectionist policies? Or does data capitalism lead to more openness and integration due to the intrinsic characteristics of data (e.g. decentralized and global distribution and access)?
- Is there such a thing as a transnational and trans-regional industry 4.0 policy for closer economic integration in the Asia-Pacific?
- More specifically, is there a need for a digital single market with unified regulations to make it easier for companies to collaborate or merge or face the scope of Chinese big players?
- Would the emergence of data capitalism be completely path-disrupting due to technologies around the IoT or path-reinforcing? Does that call for regulation or liberalization?
- Does this shift offer opportunities to leapfrog for emerging economies, with particular regard to ASEAN countries as pondered by Felker (2009)?

1.3.3 Research methods

1.3.3.1 Hypothesis

To explore whether Asian data capitalism represents a distinct regional variety of capitalism in the digital era, the null and alternative hypotheses are as follows:

> **H_0** = Asia Pacific 4.0 and related STI policies (AI, IoT, big data) DO NOT show idiosyncratic regional features that would justify Asian data capitalism as a distinct variety of capitalism
>
> **H_1** = Asia Pacific 4.0 and related STI policies (AI, IoT, big data) DO show idiosyncratic regional features that would justify Asian data capitalism as a distinct variety of capitalism

This research applies a qualitative approach through policy review and analysis because laws and policies play a major role in constituting institutional environments in which AI and data-driven technologies develop commercially and penetrate society (Barfield & Pagallo, 2018; Yin & Li, 2019). At the center of this research stand industry 4.0 policies in an attempt to explore policy dynamics in the Asia-Pacific

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regarding domestic and cross-border data-handling. Therefore, it aims to contribute to industry 4.0 policy research by approaching the topic through the *varieties of capitalism* (VoC) perspective first put forward by Hall and Soskice (2001). The concept sets itself apart from the neoclassical model and puts the government as well as social institutions at the starting point of the analysis because they intervene with policy mechanisms to steer socio-economic development, that is, it is not necessarily the market that harnesses innovational potential but the extent to which economic actors and society relate to each other through assurance and stability mechanisms set out by governmental policies (Hall & Soskice, 2001; Hoffmann, 2003). Their level of institutional complementarity —coordination, configuration, and cohesiveness of policies— account for efficient economic infrastructure and activity that are embedded within a specific, and partly cultural, domestic social fabric.

1.3.3.2 Theoretical framework

The theoretical framework applied in this study is informed by theories of VoC and path dependence to confine the direction of my research to the institutional features of digital policymaking. As such, my theoretical framework offers a focal point for exploring the field of inquiry, apply, and "test theories to predict and control the situations within the context of a research inquiry" (Adom, Hussein, & Adu Agyem, 2018, p. 440). Therefore, it builds the foundation for the conceptual framework as a typological attempt in categorizing Asian data capitalism to reinforce or reject the hypothesis of its existence. VoC as put forth by Hall and Soskice (2001) sets itself apart from the neoclassical model and puts the government and social institutions at the starting point of the analysis because they intervene with policy mechanisms to steer socio-economic development, that is, it is not necessarily the market that harnesses innovational potential but the extent to which economic actors and society relate to each other through assurance and stabilizing mechanisms reinforced through governmental policies (Hall & Soskice, 2001; Hoffmann, 2003). Hall and Soskice (2001) distinguish between liberal, coordinated, and mixed market economies (LME, CME, MME, respectively). At the core of VoC stands the differentiation between "cohesive systems of mutually supportive interconnected institutions" and "non-cohesive institutions [that] contradict and work against one another" (Carney et al., 2009, p. 365). Scholars call for extending the VoC framework that has largely ignored

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to incorporate Asian economies or put into a generalized MME category because they are "at various stages of emergence and transition and do not easily fit into the LME-CME dichotomy" (Carney et al., 2009, p. 363).[1] This thesis aims to test whether Asian data capitalism deviates from LME-CME trajectories and constitutes an idiosyncratic VoC category, or if observed global trends of convergence towards LME models of economic governance are applicable in an Asian context, which would ultimately contest Asian data capitalism. LME, CME, and MME are distinguishable through-their level of institutional complementarity —coordination, configuration, and cohesiveness of policies— that account for an efficient economic infrastructure embedded within a specific, and partly cultural, domestic social fabric. However, this does not neglect the industry perspective because VoC considers the relationship between public and private stakeholders, not their dual standpoints.

Therefore, path dependence offers a complementary theoretical approach to be embedded within the VoC context in order to conceptualize the hypothesis of a distinct Asian data capitalism, with path dependent force having shaped the public-private relationship throughout periods of economic activity, growth, and wealth accumulation. Taking the VoC concept as the theoretical starting point for my analysis, the thesis highlights the policy dimension of addressing data and the digital economy to a) scrutinize Asian economies' institutional complementarities and b) evaluate their conduciveness to the digital economy, that is, which socio- and macro-economic policies are set or planned to be set out by the government to configure and adapt within an industry 4.0 and digital economy context. To scrutinize institutional complementarities, my qualitative variables for the policy analysis include: a) a country's domestic conditions for data-derived value (demographics, development trajectories, comparative advantage, etc.), b) the domestic institutional framework for AI and data-related technology development (strategies, initiatives, legal/regulatory

[1] Set apart from the Western capitalist development, yet connected, Asian economies showcase both cohesive and non-cohesive features, for instance: Southeast Asia's "postcolonial heritage [as] an obstacle to establishing the bureaucratic capacity needed to implement state-led industrialization" (Carney et al., 2009, Table 1; Tipton, 2008) as opposed to Singapore's attractive multinational corporations model with "competent economic bureaucracy [and] complementary blend of liberal and coordinated market institutions that support accumulation of high quality technical skills" (Carney et al., 2009, Table 1; Ritchie, 2008).

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environments), and c) data-regulations and implications for commercialization. Figure 1 highlights the rationale for my choice of variables.

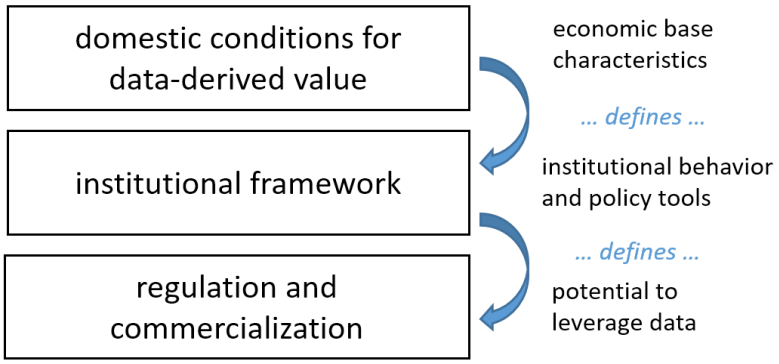

Figure 1 Qualitative Variables for Analysis

The domestics conditions for a digital economy to leverage on data define an economy's core characteristics hence why path-dependent forces shape and define institutional arrangements and frameworks for policymaking, such as (de-)regulation and incentives to commercialize on big data, that either follow or deviate from previous economic development trajectories (Lundvall, 2012). Thus, the way policies touch upon innovation-related topics discloses an economy's institutional setup which its operational framework is based on. The effectiveness of this setup is impacted by the extent to which institutional complementarities produce cohesive policies and how they translate into (de-)regulation and commercialization. As for the Asia Pacific, path dependence in economic and political spheres of interaction has been characterized by the East Asian miracle and flying geese paradigm in various scholarly contributions (Beeson, 2009; Chang, 2007; Felker, 2009; Gill et al., 2007; Hartley et al., 2018; Hundt & Uttam, 2017; Jackson & Deeg, 2008; Kalinowski, 2009; Li & Piachaud, 2018; Lundvall, 2012; Ozawa et al., 2001).

1.3.3.3 Conceptual framework

Derived from the theoretical underpinning, my conceptual framework relies on the aforementioned developmental state features in policymaking to describe Asian data capitalism. My concept puts forth that Asian data capitalism is to be considered as a distinct variety of capitalism that follows the path of a digital state development capitalism under the condition of digital and industrial 4.0 policymakers formulating policies that associate with path-dependent developmental state patterns of economic governance in the face of 4.0's uncertainty (Wong, 2011): strong state intervention, as

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well as extensive regulation and planning (Kalinowski, 2009; Li & Piachaud, 2018; Ozawa, Castello, & Phillips, 2001) with "stable oligopolies, coordinated labour markets, [and] government-business consensus on sectoral targeting" (Felker, 2009, p. 477). The conceptual framework (Figure 2) was developed upon scholarly literature on VoC theory, path dependence, and developmental state capitalism in Asia.[2]

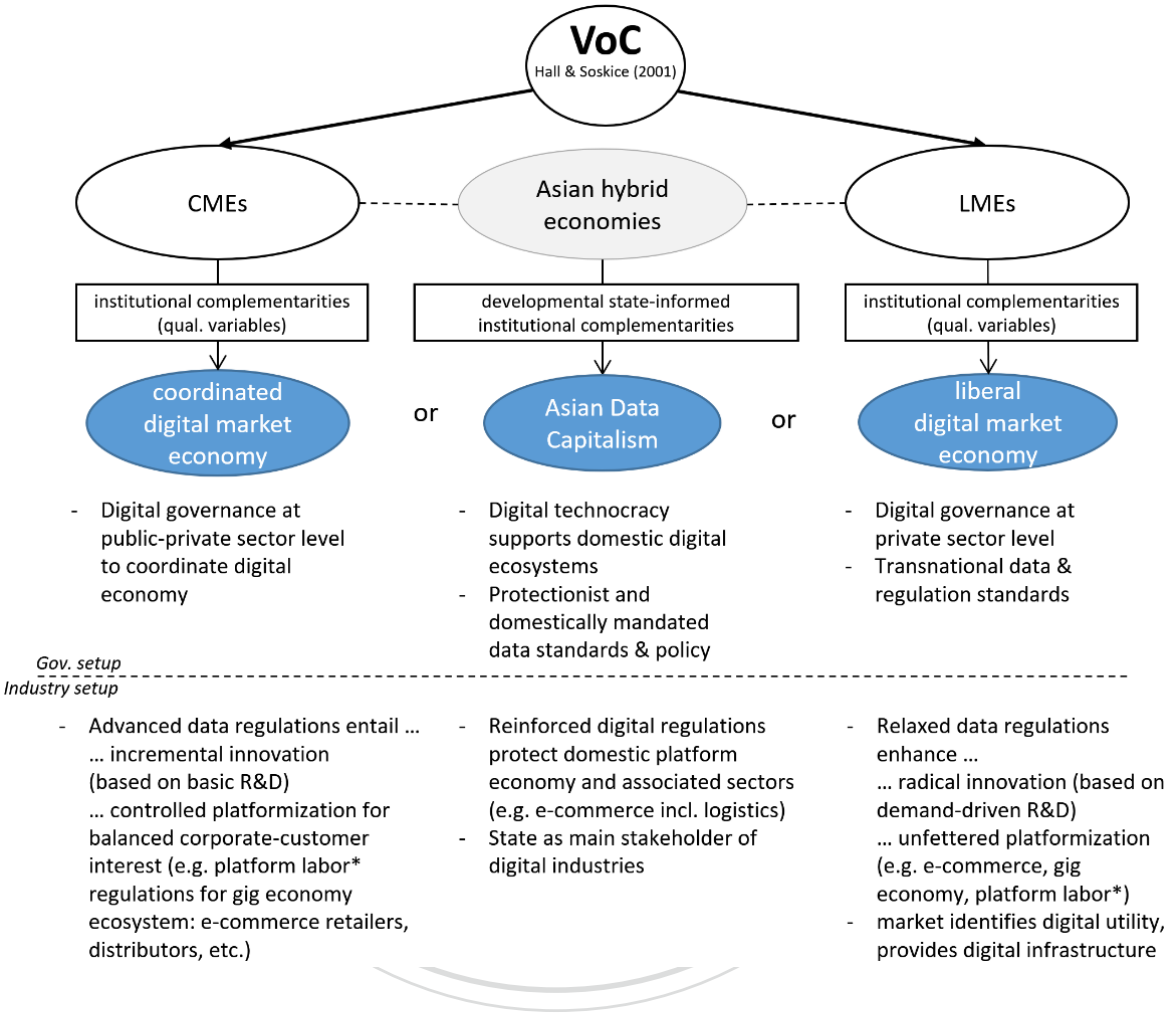

Figure 2 Conceptual Framework Defining Asian Data Capitalism

*Notes: *Platform labor in digital (platform) economies –sometimes referred to as gig economy– denotes labor that is allocated via digital platforms and, therefore, strongly connected to questions about income distribution, welfare, and related reforms fit to the digital economy (Heeks, 2018).*
Source: The author

[2] The theoretical rationale of the conceptual framework was informed by Adom et al. (2018); Barfield and Pagallo (2018); Beeson (2009); Chang (2007); Felker (2009); Foster and Azmeh (2019); Gill et al. (2007); Grimes and Yang (2017); Hall and Gingerich (2009); Hall and Soskice (2001); Hartley et al. (2018); Hundt and Uttam (2017); Jackson and Deeg (2008); Kalinowski (2009); Kang (2003); Li and Piachaud (2018); Lundvall (2012); Ozawa et al. (2001); Sheng (2007).

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Within the VoC concept, Asian data capitalism as an institutional approach relying on path dependence would, therefore, set itself apart from CME and LME models of digital economic governance in terms of digital technocracy supporting domestic digital ecosystems in their emerging phase, with protectionist data policies and standards regarding foreign competition (see Figure 2 Conceptual Framework Defining Asian Data Capitalism).[3] From the industry perspective, under Asian data capitalism, reinforced digital regulations and domestic standards would boost and protect domestic digital ecosystems such as e-commerce and other platforms as touched upon in the literature review. Under Asian data capitalism, one could expect institutional complementarities such as restrictive cross-border data flows and localization regulations to limit foreign companies in exploiting domestic data-derived value, and, from an industry perspective, preferentially treated platform providers and associated businesses such as retailers, distributers' logistics networks, and companies enjoying unfettered access to direct governmental financial backup in their digital expansion. Summing up, the concept of Asian data capitalism assumes path-dependent forces and institutional complementarities that create institutional frameworks and policies encompassing domestically mandated standards regarding digital transactions, and restricted data access and collection for overseas businesses, competitors, and foreign MNCs operating in the country. Following the theoretical framework of integrated path dependence within VoC theory, the conceptual framework will be applied to the qualitative variables (as outlined in Figure 1) to the cases of Singapore, Japan, China, South Korea, and ASEAN as a regional intergovernmental organization and economic interest group. A multiple case study analysis can comprehensively shed light on continuation or deviation from path-dependent growth models and, thus, validate or contest Asian data capitalism in the VoC framework. The countries were chosen as examples on the basis of developmental state literature that categorizes the country cases within a flying geese scheme: Japan as the first industrializing and momentum-inducing

[3] Relevant technocratic and protectionist industrial policy instruments are temporary protection, public funding for capacity expansions, and performance-based export funding, accompanied by measures to upgrade industry-specific skills through the selective transfer of technology (Chang, 2006). The effectiveness of these measures depends on the development of relatively cohesive states with political authority, since this is the only way to implement state control of private investments (Kohli, 2012).

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precedent, followed by South Korea and Singapore –among others– as representatives of NIEs in East and Southeast Asia, respectively, as well as the cases of China and ASEAN as 'latecomers', with particular regard to China's emphasized influential role for economic activity and rise to powerful player in the region. This way, a well-balanced selection of economies in the Asia Pacific can be delivered, pertaining to both the theoretical and the conceptual underpinning.

1.3.3.4 Scope of the study

This thesis focuses narrowly on the interlinked political and economic factors affecting governments' policy approaches to the digital economy. Nonetheless, the digital economy is a broad topic, often with unclear or different definitions by different entities. Therefore, I put emphasis on artificial intelligence (AI) as the specific focus of this study because, despite countries' different development stages, AI stands at the core of the digital economy, for industry and service sectors alike, as it is pointed out to be the overarching technology that allows extracting value from big data and hence makes it possible to let the digital economy emerge and develop in the first place (Ding, 2018; Kiel, Müller, Arnold, & Voigt, 2017; Lee, 2018; Schroeder, 2016). The study deploys policy and document analysis of secondary source material such as books, journal articles, and periodicals. Primary sources for analysis include government releases, laws and acts, their amendments, and related policy guidelines that touch upon the study topic AI.

This thesis will be guided by supplementary definitional benchmarks for regional integration in order to deliver an adequate answer as to whether economies in the Asia-Pacific show idiosyncratic features of similar policy approaches that would qualify them as a distinguished variety of capitalism (Asian data capitalism) and justify the extension of the VoC concepts as suggested by scholarship. *Regional economic integration* will be addressed as a "multifaceted process, whereby sovereign nation-states establish common political, legal, economic, [or] social institutions for collective governance" (Hix, 2001). I will rely on a simple definition model of economic integration with essentially two factors that define the economic integration between states with " 'positive integration' as the formation and application of coordinated and common policies to fulfill economic and welfare objectives [through creating common sovereignty] … [and] 'negative integration' includes the removal of discrimination between economic agents of member countries [such as lifting

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restrictions on the movement of goods and services]" (Pinder, 1972, p. 126, cit. in Thanadsillapakul, 2009, p. 134). It is also important to distinguish between integration and cooperation. In the former, there is a transfer of sovereignty to a higher entity based on the proposed objectives. In the latter, it is more a case of basing commonly agreed policies on a set of specific agreements (Scharpf, 1996).

Another data-related benchmark indicator adopted in the case studies is the European Union's (EU) General Data Protection Regulation, henceforth GDPR (2018). In tandem with globally expanding digital connectivity, regulatory grey zones regarding the categorization of data into personal and public data emerged. The increasing cross-border flow of data due to globalizing business operations, and the necessity for clear domestic conditions around the commercial use of personal information call for the establishment of standards to streamline data-handling processes internationally in order to leverage the full potential of the digital economy as a new way of growth (Mashiko, 2020). The GDPR superseded the EU's former Data Protection Directive and was enforced across all EU member states from May 2018. As an advanced personal information protection scheme, it allows for evaluating comparable mechanisms, data-handling schemes ,and privacy policies in the Asia-Pacific region, and their role in regional integration.

> "The [GDPR] … has set the initial global standard for modernizing data policy frameworks by defining, clarifying, and protecting the rights of European Union residents over their personal data. Noncompliance of these data rights and obligations exposes data processing firms to large fines, regardless of their country of origin. Given the European Union's size and interconnectedness in the global economy, the implications of GDPR extend across international borders." (Carrière-Swallow & Haksar, 2019)

I justify using the GDPR as a benchmark and starting point for the analysis of economic integration through the STI policy lens for the following reasons. Firstly, one of the major changes enforced with the GDPR concerns economies in the Asia-Pacific through its territorial scope. The data protection law now applies to all companies operating on the European market regardless of whether companies are EU-based or where the personal information and data is processed (GDPR, 2018, art. 3). Thus, providers of goods and services, as well as organizations based in the Asia Pacific must comply when handling data of EU citizens. Secondly, companies that process personal data must obtain clear and voluntary consent from customer, users,

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and other data subjects (GDPR, 2018, art. 7) [4], and grant the 'right to erasure', also called 'the right to be forgotten', meaning that companies must delete personal information if requested by the data subject or consent is withdrawn (GDPR, 2018, art. 17). This regulation is largely due to a judgment of the European Court of Justice which imposed on Google to delete search results at the request of users that violate their privacy, representing the stark regulatory power of European legislation over one of the biggest companies in the world from another jurisdiction. Not only is it interesting to scrutinize how policymaking in the Asia-Pacific relates to these changes, but to analyze to which extent the principles of "data protection by design and by default" (GDPR, 2018, art. 25-1, 25-2) impact the overall concept and development of any data treating process for AI, IoT, or other data-derived application in terms of their privacy-friendly default settings. Thirdly, the GDPR takes a primarily Western philosophical approach to data protection, considering privacy as a basic human right, emphasized in the EU Charter of Fundamental Rights (Goddard, 2017; Mattoo & Meltzer, 2019). This represents the intersection of cultural values, political decision making, and economic rationale. Could it be that distinguished cultural spheres in the Asia Pacific approach or interpret privacy differently so that it would clash at the contact zones with the GDPR? As a weighty and influential economic block, aligning with the GDPR provisions is a vital measure for economies outside the EU in order to facilitate a seamless cross-border flow of information and digital trade. Synchronization and/or alignment with the GDPR will thus be scrutinized in this study to highlight Asian economies' handling of and approach to the emergence of international standards regarding the cross-border flow of data. This could result in alignment with provisions, individual countries' deviation from provisions, or patterns of collective alignment or collective deviation from GDPR-like data privacy and protection principles. Moreover, I will look into adjustments of case study economies' intellectual property rights and copyrights. This is because AI has opened up new channels of mining, scraping, and compiling data from various sources over the internet without human supervision, giving scope to businesses to build databases, develop highly valuable algorithms, and thereupon

[4] Clear and voluntary consent means that there cannot be any form of presumed consent that would tie the contract to the processing of data that have nothing to do with the service or product provided, e.g. through preset ticked boxes.

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claim copyrights and intellectual property rights. However, with missing frameworks and related policies having been set out only recently, there is a need to address questions of ownership of algorithms or data-based application that themselves are AI-derived from other copyrighted data (Iphofen & Kritikos, 2019). For instance, it is questionable if a dataset can be copyrighted or registered for intellectual property if an algorithm compiled it itself through machine-learning techniques that a programmer may have provided the source-code for but, eventually, him- or herself has no access to comprehending how and why the algorithm came up with certain decisions to include a particular information. This would lead to a highly philosophical discourse around the meaning of 'human-like' intelligence as opposed to purely human intelligence and whose creativity is to be legally protected for what purpose. Therefore, I will focus on the economic rationale of intellectual property and, specifically, copyright regulations in the case studies in an attempt to analyze how countries address issues arising from digital connectivity through IoT, AI, etc.

1.4 Chapter outline

Chapter one has so far presented the thesis topic and the assumption of a term coined 'Asian Data Capitalism' within 'Asia Pacific 4.0' as a geo-economic construct. Moreover, it introduces the research outline, theoretical and conceptual framework of the thesis, and the exploratory research approach to finding out whether Asia Pacific 4.0 and related domestic STI policies (AI, IoT, big data) show idiosyncratic regional features that would justify Asian Data Capitalism as a distinct variety of capitalism. Chapter 2 includes a comprehensive literature review to highlight the value of data and data-driven technologies by delivering examples from the Asia Pacific to contextualize the theoretical background of data as a resource for economic activity. It touches upon digital servitization trends, platformization, and the implications for policymaking. Chapter three consists of the policy analysis including government releases, laws and acts, their amendments, and related policy guidelines that include or touch upon AI as the study focus. I limit the number of economies studied to the cases of Singapore, Japan, China, South Korea, and ASEAN as a regional intergovernmental organization and economic interest group. The qualitative variables (Figure 1) are examined for each case, respectively, in an attempt to highlight institutional frameworks for digital policymaking, and shed light on path-dependent

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forces as well as institutional complementarities. Chapter 5 illustrates the implications of government-industry relations for digital governance, using the example of the Alibaba Group e-commerce ecosystem in the region. The conclusion in chapter 5 contains the synthesized variable outcomes by presenting a summary of similarities and differences in a comparable fashion that allows for hypothesis testing in the discussion by revisiting the conceptual framework to contextualize digital policymaking in the Asia Pacific.

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Chapter 2. Literature review: Asia's digital transformation

2.1 Manufacturing base 4.0

Technology can rarely be reduced to its commercial value. The societal benefits of technological advancements have undoubtedly equalized the average wealth of people all over the globe, for instance, through fast-paced catch-up periods in the Asia-Pacific under economic auspices of the U.S. and Japan. The history of the industrial revolution teaches us that nation-states have an interest in establishing and preserving the foundations of their wealth through economic pioneering and the innate character of the capitalist mode of production – using available and create new technologies to boost productivity and add value. To harness and leverage the potential of data-derived value, a national manufacturing base will remain a necessary condition to catch up or innovate. Thriving emerging economies in ASEAN with manufacturing at the core of their catch-up experience record big gains at a faster pace than ever in their national development due to cost-reducing ICT (Asian Development Bank Institute, 2014; Chitturu et al., 2017). According to the Initiative for ASEAN Integration launched in 2000, the beneficiaries are the new ASEAN member countries Cambodia, Laos, Myanmar, and Vietnam (CLMV) for the sake of their development and integration into ASEAN through implementation mechanisms regarding ASEAN agreements and commitments (ASEAN, 2015, 2016). Ozawa et al. (2001) point out that the digital economy requires a) a successful IT revolution through deregulation and free-market transactions as well as b) applying information technology to enhance transactional efficiency and productivity. Therefore, the more conservative and inefficient an industry is, the greater are the potential benefits from newly applied information technology to boost productivity growth. The authors add that many Asian governments still heavily regulate certain industries but commence to liberalize these against the background of inflows of FDI and in the face of global competition. Haraguchi, Martorano, and Sanfilippo (2019) also mention that technological advancements have been mainly made with regard to industry 4.0 and automation in manufacturing industries on the basis of knowledge. Thus, a domestic manufacturing base closes technological gaps by promoting the adoption of new technologies and the development of high-productivity jobs as has been accounted for in China and other emerging economies (Baldwin, 2016; Haraguchi et al., 2019). These findings are in line with Kam (2017) who adds that "the Factory Asia model continues [but]

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countries capture more value in global value chains. The gaps in the rate of upgrading are identified and mainly attributed to differences in government policies and competition" (p.4). This underlines the essential role of governmental decision-makers. However, the development of Asian economies' manufacturing bases and their thriving were largely subjected to Western demand for goods, or as Wong (2011) says "[i]ndustrial Asia's dependence on cost-competitive manufacturing exports has proved to be its Achilles' heel" (p. 166).

Thus, hardware and software computing capacity can be considered a new strategic advantage and endowment for countries. In the capitalist mode of production, value can only be extracted through the exploitation by technology and human resources. As for data as a resource, while its availability and a skilled workforce for data analytics play important roles in the IoT revolution (Ozawa et al., 2001), and their development has certainly been targeted by policymakers, only China, Japan, South Korea, and Singapore have actively supported the expansion of domestic computing capacity to the extent necessary. For instance, China has the worldwide second best-performing supercomputers after the U.S., Sunway TaihuLight and Tianhe-2A in Wuxi and Guangzhou, respectively (Strohmaier, Dongarra, Simon, & Meuer, 2019), and a vast amount of data processing for data treatment and storage. Just like any resource, data needs the technology to be exploited, which is a powerful computing capacity. As trade conflicts may arise and impede the anticipated free flow of data, domestic computing capacities and access to cloud-based computing power provide a comparative advantage for digital economies. Besides the aforementioned Asian economies of China, Japan, and South Korea, countries in the Asia-Pacific are relatively well-positioned given their competitiveness regarding their strong manufacturing bases for powerful computer chips and their integration in regional supply chains and production networks, particularly in emerging economies in ASEAN that can benefit from outsourcing and technology transfer (Asian Development Bank Institute, 2014). Therefore, computing capacity can be considered a strategic advantage and endowment in favor of digital, smart, and interlinked production networks of the future

Notably, China's integration into global ICT value chains and global production networks has taken place as large corporations outsourced increasing amounts of manufacturing and assembly tasks. Technology autonomy was sought after to boost indigenous innovation by leveraging market access, which China has

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partially achieved through domestic brands and building ecosystems through new business models based on datafication, big data analytics, and platformization (e.g. DiDi and Taobao's logistics networks in China or Southeast Asia's premier on-demand multi-service mobile application Gojek), as well as introducing large-scale mobile payment services (Chen & Qiu, 2019; Li, Frederick, & Gereffi, 2018). However, China is still lacking significant core technologies in critical areas identified for the *Made in China 2025* strategy (Grimes & Yang, 2017). Thus, a fostered national manufacturing base remains a necessary condition for creation and innovation, especially with regard to the emergence of smart factories where streamlined processes and real-time casting lead to increases in efficiency and sustainability through "smart materials, smart products, or smart machines which communicate with each other in smart (networks)" (Götz & Jankowska, 2017, p. 1635; Tan, Ji, Lim, & Tseng, 2017). Digital connectivity adds a new layer to the manufacturing sector, with the ability to operate through cyber-physical spaces of the IoT and IIoT in which suppliers along the value chain are highly integrated through AI and algorithm-based (cloud) systems, predicting and bringing down total-cost-of-ownership for manufacturers through economical, sustainable, and scalable operations and investments (Brad, Murar, & Brad, 2017).

However, manufacturing intelligence and automation powered by AI and IoT/IIoT systems are likely to displace costly labor in heavy industries and agriculture but, simultaneously, allow to release labor into the tertiary sector considering ongoing trends of servitization (Kuo et al., 2019). For China, Hawksworth and Fertig (2018, p. 3, Table 1) estimate that a share of 21 percent of service sector jobs as of 2017 will be displaced in the short-term but job creation through AI and related technologies will offset this loss by 50 percent — simply put, 97 million jobs could be added to China's service industry until 2037. However, this does not imply that the share of industry jobs must decline. On the contrary, industry jobs and tasks may transform and require a specialized workforce with high levels of technical and digital literacy. The authors predict that 63 million industrial jobs might be created whereas only 59 million are displaced: a net effect of 4 million new jobs added to industry and manufacturing (ibid.) in tandem with changing demands, goods, and consumption habits (Kuo et al., 2019).

The issue of industry change through harnessing the power of data through AI applications in and outside Asia's factories bears the risk of large-scale job

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displacement. To transform the workforce and sustainably release labor into the tertiary sector considering ongoing trends of servitization (Kuo et al., 2019), public and private stakeholders are to establish cohesive institutional complementarities. Industrial relations and vocational training/education should be targeted to ensure reskilling and upskilling of the workforce based on domestic industrial profiles, for instance, through flexible labor markets in tandem with constant monitoring of industries at risk, professional conversion programs, and social safety nets guaranteeing stable interim periods, or selective immigration policies to attract foreign talents like AI researchers (Araral, 2019; Hawksworth & Fertig, 2018). Moreover, intensified multilateral collaboration may become necessary because other leaders in semiconductor manufacturing markets, such as Japan, South Korea, or Singapore are strong performers (Rasser et al., 2019). Therefore, they have the potential to set global standards in hardware production or convergence of hardware with big data-driven applications (e.g. South Korea's smart semiconductor ambitions), as well as regulatory standards these data-derived applications are based on.

2.2 The digital economy

In establishing and preserving the foundations of an economy's wealth, the capitalist mode of production has innate that it not only produces but also needs growth to function by exploiting labor and resources using available and allowing new technologies to boost productivity and add value. Even in the digital age, this principle remains at the core of capitalist logic, but the new resource to leverage is data – big data (Buyya, Yeo, Venugopal, Broberg, & Brandic, 2009; Srnicek, 2016). As a hot topic of the 21st century, artificial intelligence, which is feeding on data as a resource, is namely the potential new driver of reshuffling and reconfiguring supply chains across the globe as well as for emerging new business models based around IoT. Some may associate AI with progressive improvement and enhancement of human development, others may react leery to the exponentially growing field of AI application with regard to job displacement and dystopian surveillance state scenarios à la George Orwell. However, artificial intelligence has reached new levels of maturity over the past years and is gradually becoming a driver of digitalization and autonomous systems in all life areas, not only in the private sector for commercialization purposes but also for public use. Therefore, the state, society,

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economy, administration, and scientific stakeholders are required to cope with AI emergence, development, and applications to adequately address opportunities and risks.

Countries worldwide have set up AI and ICT strategies to enable digital policy-finding processes that incorporate data as a resource into domestic industrial and societal development frameworks. These strategies are propelled by tremendous progress in research and application of AI systems dealing with unprecedented amounts of data, which gave scope to the recognition of digital data infrastructure being a matter of global relevance. For instance, the joint AI statement of all G7 countries, the Charlevoix Common Vision for the Future of Artificial Intelligence (2018), to promote the development and application of human-centric AI may pave the way towards global guidelines and (non-)binding codes of conducts regarding future data-handling to effectively apply and monetize on human-centric applications and solutions to humanity's problems and needs on a global scale. For example, the statement touches upon privacy and personal data protection in tandem with the free flow of information to achieve inclusive and equality-enhancing participation rates of all societal and socio-economic stakeholders. If we go back to the connotation of data as a resource considering the internet as the infrastructure to provide and access data on a global scale, it is, therefore, important to develop common-sense towards how to cope with, extract, allocate and share this resource for the benefit of all. Scholarship advocates that "algorithm technologies are a part of broader social realities … and thus their design and development should be grounded in users' interests and rights within a social, political, and cultural milieu" (Shin, 2019, p. 276). However, it can be argued that due to the variety of socio-political and cultural milieus in a globalized world, the perceived potential and benefits of data-driven technologies differ from country to country, depending on needs, vested interest, and application scope and scale. For instance, European countries mainly see the economic potential in AI whereas Japan goes beyond 4.0 connotations jumping straight to something they call society 5.0, a vision of AI as the next step in human evolution and an unavoidable part in everybody's life. China emphasizes a variety of potentials from the military to civil society, whereas India stresses the social aspects of AI such as the potential to alleviate poverty.

A thriving digital economy depends on a country's capacity to leverage ICT and innovate. If data provides the resource for cyber-physical spaces in which

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economic and societal stakeholders interact, ICT technologies with the Internet and IoT as a platform may represent a vital public good referred to as digital utility (Chen & Qiu, 2019; Sawada, Park, & Dembowski, 2018). The concept is also in line with computer scientists considering computing, especially cloud computing, to be the fifth utility after water, electricity, gas, and telephony (Buyya et al., 2009).

It has been long established in economics that utility markets are prone to monopolization (Newbery, 2002), so they require state regulation to balance the interests of investors and consumers for the sake of system stability and the common good (Demsetz, 1968). Usually, the state is seen as the main facilitator of utility infrastructure. Now, multi-purpose platforms such as Google in the West, Tencent's WeChat in China, or Indonesia-based multi-service mobile application Gojek operating in many countries Southeast Asia as well as their regional competitor Grab from Singapore, have achieved a tremendous scale beyond their core businesses from social media apps to mobile payment systems – a phenomenon referred to as "infrastructuralization" of platforms (Chen & Qiu, 2019, p. 276). This thesis, therefore, scrutinizes the forms in which governmental policies address and shape the distribution of digital utilities to public and private stakeholders. Cooperation between stakeholders is needed at any level to guide the technical change that Schumpeter coined with the term 'creative destruction' and Soete (2013) highlighted as 'destructive creation', benefiting the few at the expense of the many. Castells (2009) also poses the question of who contributes and creates value, and whether tech-savvy elites will be the only ones benefitting. This touches upon the discourse around data ownership and the extent to which private and public data are monetized upon. Lundvall (2017) adds that there is a link between neoliberal deregulation that led to the 2008 crisis and ICTs, which might actually slow down the formation of a new techno-economic paradigm based around AI, the IoT, etc. However, the 2008 crisis also showed that pronounced state intervention helped Asian economies to stand out and bring back into question the extent to which governments should act on laissez-faire principles or strengthen their role in the transition to the digital economy.

The private sector is a major facilitator for data-related innovation and AI development, and viable interconnected ecosystems are strategic assets driving the private sector. In the leading countries, the US and China, globally operating corporations and young tech companies are the main drivers of the vivid dynamics of AI development. For instance, in Japan and South Korea, globally operating and

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hardware-oriented conglomerates drive AI development. While in the US, these dynamics are reinforced by deregulation, China gradually tends towards increased state control of large technology companies. Strong market-oriented development in both Asia and the US put them in an advantageous position vis-à-vis AI development and application due to more liberalized regulatory frameworks regarding data handling as opposed to continental Europe where firms are falling behind. Connecting AI-related research to the needs of industries has been a major challenge whereas in the US, these connections between science and the economy established over the course of decades already. In order to develop better solutions, there is a need for researchers, talented developers, tremendous amounts of data, computing capacities, strategic entrepreneurs and experienced investors, and versatile legislature. While these factors are most conducive to the successful commercialization of AI in the US and China, in Europe only the United Kingdom is beginning to do so. In Japan and South Korea, these factors are concentrated within large corporations and conglomerates such as the chaebols in South Korea, however, local start-up ecosystems remain small. But it is the latter that should be actively supported to the extent necessary in order to achieve inclusive and broad data-fueled ecosystems to establish thriving digital economies.

Nonetheless, innovation systems must be steered by adequate policies. National innovation systems, as described by Nelson, Freeman, Lundvall, and Pelikan (1988) and Lundvall (2017), are strong and sustainable with cohesive institutional complementarities, which in the case of Asia's rapid industrialization pose more of an obstacle than to Europe and the U.S. with a fairly longer period of institutionalization and constant refining of the latter (Lee & Shin, 2018). A large portion of VoC literature predicts global convergence towards total liberalization which often is roughly referred to as the 'more market and less government' principle. Carney et al. (2009) summarized VoC literature in an Asian context and offer a resourceful repertoire of VoC theory on the case of Asia-Pacific 4.0. The government steering through liberalization may enhance digital connectivity but it should also intervene and constrain neoliberal forces for the sake of all stakeholders in the society if deregulation widens the technology and the wealth gap and, thus, increases or generates new channels for inequality.

Path-dependent forces still condition policy formulation and institutional change. Liberalizing elements have been introduced in Asian economies, however,

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old patterns of policymaking that used to work back in the days of technology imitation are often still relied on to cope with new challenges of industrial upgrading in East and Southeast Asia (Felker, 2009; Kalinowski, 2009; Mahbubani, 2009; Ozawa et al., 2001; Park, 2000; Schot & Steinmueller, 2018; Wong, 2011). The shift towards innovation can be referred to as a path-dependent function of cultural and institutional drivers and inhibitors. In their VoC compilation, Carney et al. (2009, Table 1) analyze Dodgson (2008) on national innovation systems and institutional adaptability and find that whereas "Taiwan's network-based innovation strategy resembles liberal market economy[,] Korean firms retain commitment to large business group capital allocation methods that may retard leading-edge entrepreneurship". Kalinowski (2009) finds similar path-dependent forces impacting national innovation policies in Korea. Nonetheless, Mahbubani (2009) adds that path-dependence does not intrinsically impede economic change because oligopolistic chaebols factually embraced it, however, they were less interested in sharing or giving up their power and position, thus, impeding a structural change of the VoC sphere of industrial state-enterprise relations. Schot and Steinmueller (2018) elucidate this general pattern of path-dependence by saying that there is "a balance … between major disruptive innovations that alter the trajectories of search and improvement (path-disrupting), and cumulative innovations that reinforce and strengthen existing strengths and centers (path-reinforcing)" (p. 1558).

However, to explore potential fields of the nascent digital economy, different countries choose different approaches not only according to their comparative advantages and natural endowments but also with progressive policy attempts to diversify their national economic landscape. For instance, the governments of Korea and Japan invested in and nurtured the creative industry and promoted Korean and Japanese pop-music to an extent that gave rise to an entirely new sector dedicated to digital content and new marketing strategies based on entertainment: In 2018, Japan and South Korea had the third and fifth largest sales of digital media in the world and their sectors continue to grow (Holroyd, 2019, p. 13). Seoul's newly erected Digital Media City, Korea's first creative cluster, houses broadcasting channels and was set up to connect small businesses with big players through subsidizes office rooms, etc. (Cohen, 2013). Such creative hubs have become a target point in creative policy formulation with regard to open up new channels of enhancement for the digital economy. However, if poorly steered by the government, this can bring up new

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issues. Bunnell (2002) notes how the Malaysian multimedia corridor led to new forms of social and spatial exclusion through financial exclusion from the privatization of high-tech spaces.

2.3 Digital servitization and customer experience

Access to Asia's large middle-class and growing transboundary consumer market will be of tremendous importance for businesses, especially with regard to data-enabled customer insights and targeted marketing to personalize goods and services, for instance, in Korea where consumption serves as a strong marker of social class distinction (Koo, 2007) or in China where vast 4G/5G coverage in tandem with increasing mobile phone penetration enables a) businesses to analyze their customers' ever-growing amount of data as well as b) personalizing goods and services demanded by the growing and consuming middle-class that consequently generates even more data (Hawksworth & Fertig, 2018). In Asia's digital transformation, what is tremendously changing and redefined is the hyper-competition on the business side and the customer experience on the buyers' side. Selling a lifestyle to people and offering personalized goods and services has become a new value-adding mechanism in the digital age at relatively low cost through scale. Data science, with particular regard to AI solutions, is considered the backbone to "transforming the customer experience and leveraging data for operational efficiency and insights" (Microsoft Asia News Center, 2020) by bringing down costs and analyze market demand for fast reaction and adaption for manufacturing as well as service businesses.

E-commerce and retail are booming sectors across the Asia Pacific, with a lot of potentials to apply data-driven solutions to meet the consumption aspirations of a growing middle-class. In sectors like retail, Asia is leading the way, for instance, with Alibaba's Hema concept stores now found all over China and offering a new kind of offline adventure derived from their well-established online presence over the past years. Procurement and supply are connected in that online customers on Alibaba platforms and offline customers in Hema stores alike find the same products, can order online or via QR codes in the store and have their products delivered to their home within a short period, the same day or even in two hours. This is about educating the modern customer of the possibility, making it the norm, eventually. Southeast Asia's main e-commerce platform Lazada –present in six ASEAN

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countries– is still offering a mere two to five-day delivery. But with Alibaba owning large chunks of Lazada, the knowledge around fast-paced logistics and customer experience may well be implemented there as well. Ultimately, a larger customer base equals larger amounts of data on customer behavior for better customer engagement, business intelligence, and, therefore, higher competitiveness. However, this is not necessarily a distinct feature of Asian e-commerce. This happens in the West as well, but the urban population in Asian cities is much higher than in the West and the fact that two-thirds of the world's middle class will live in Asia by 2030 may be beneficial in terms of up-scaling logistics and the option for companies and platforms to offer these new game-changing services (Khanna, 2019).

Any new retail company entering markets is well-exposed to this hyper-competition and would have to build their business model around these norms and benchmarks that two-thirds of the global consuming middle class is accustomed to. Ultimately, this may be leading the way to new positive customer experience and forms of data generation for faster development of new business models around this experience, giving scope to Asia operating at the forefront of online retail for customized consumption.

Another digital disruption in customer experience is occurring due to human-centered service platforms beyond retail and e-commerce for intensive use of AI-applications coupled with personal data provisions. For instance, China-based Ping An Financial runs a service called 'Ping An Good Doctor' which offers the ability to book a doctor within a couple of minutes for fast prescriptions or AI-powered pattern recognition of the health problem to make a quick customer transfer experience to a specialist (Brown, 2019). As opposed to AI in this entire customer experience chain, therefore, does not necessarily replace the human contact but may have the potential to better connect personnel of the health sector and takes over diagnosis tasks that can increase the time clients spend with their doctor or staff. Ping An Good Doctor may thus destroy value in that repetitive tasks such as filling out spreadsheets may be taken over by AI algorithms, at the same time, it transfers value in that it opens up space for increased human interaction, probably one of the highly valued core aspects of future societies with increasing amounts of elderly people such as the Japanese society or China and the West alike. However, as a rent-seeking business monetizing upon healthcare and social interaction, the capitalist logic still calls for strategic partnering and growth strategies. As for Ping An Good Doctor, for instance, the company

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expanded into Thailand's health market and partnered up with the country's largest healthcare group Bangkok Dusit Medical Services to provide Chinese customers with a second opinion and more diverse treatments via video consultation with an overseas doctor (Ping An Healthcare And Technology Company, 2019).[5] Ping An Good Doctor shows to which extent data-driven business models around improved customer experience can reshape or give rise to digital supply chains on a global scale, including the core healthcare service coupled with intensive use of secure telecommunication technologies for overseas healthcare video consultations, integration of offline-hospitals and pharmacies and improved logistics by incorporating local delivery providers for fast drug delivery. However, the treatment and cross-border flow of personal data simultaneously give scope to rethinking the extent to which these data have to be secured and protected. There is a need for collaborative efforts to set standards in data-handling domestically as well as internationally in order to leverage the potential of digital applications and data-derived value. These can be addressed through coordinating and streamlining regulatory environments on a policy level.

2.4 Collaborative digital networks

As for every wave of technology adoption, industry 4.0 and the transition to the digital economy are highly marked by the uncertainty of revenue and sustainability, but regional integration and cooperation can help share the risk through scale. Scholarship unanimously agrees that cooperation on every level is one of the key factors for a successful economic future in Asia-Pacific 4.0 (Table 1, Appendix 1). As discussed in the section about digital customer experience, human touchpoints, as created through platforms, for instance, represent an impactful factor that defines and enables businesses to thrive in the digital era. Cooperation between companies and public-private stakeholders defines the extent of access to Asia's large middle-class and growing transboundary consumer market and will be of tremendous importance for businesses, especially with regard to data-enabled customer insights and targeted marketing to personalize goods and services. Ultimately, cooperation as in open-

[5] Other regional health care markets and hospitals of Ping An's network are situated in Singapore and South Korea, as well as overseas in the US and Switzerland (Ping An Healthcare And Technology Company, 2019).

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sourcing and data-sharing enables businesses to apply big data analytics on customers' ever-growing amount of generated data on their behavior as well as, thereupon, personalizing goods and services demanded by the growing and consuming middle-class (Hawksworth & Fertig, 2018). Who cooperates is able to share the risks of ventures, investments, or R&D through market size/scale and access to local businesses and customer feedback. Artificial intelligence will be the backbone of the digital economy and society, and cooperation between stakeholders can unleash its full potential: "Workplaces and family, governments and markets are all multi-agent activities. The individuals compete, cooperate, negotiate and predict to reach their goals. AI should capture all of these actions" (Macaulay, 2018). On the business side, for instance, Shafto (2016) uses the example of AI open-sourcing as a form of cooperation: Google provides its algorithms for free and moves away from conservative forms of cut-throat competition. They hope for innovators to use and add up to it in order to further develop AI and come up with ideas to grow businesses, hence, ensuring their and Google's own survival. Therefore, enhanced cooperation may fuel future competition and the coevolution of innovations alongside this collective process — not only for corporate but also for the greater social good if AI uses a multi-agent approach (ibid.). Also, Yoshimatsu (2007) brings up an interesting argument: techno-regionalist collaborative efforts for setting regional Asian ICT standards could serve not only diffusing own standards and leverage their economic potential but also China could find interest in establishing such infrastructures to break Western ICT monopolies for the sake of economic and political intentions.

While firmly integrated into international GPNs, Asia's innovation network is much more localized within multi-local networks: "the solutions offered in each local market are tailored to local consumers and regulation and usually managed by local entrepreneurs" (Tonby et al., 2019, p. 49). Using network theory, Sheng (2007) sets forth the emergence of hubs and intraregional competition and cooperation. The combination of local innovation and intraregional funding and knowledge is making Asia a global innovation powerhouse:

> "Developing startup ecosystems in Emerging Asia and Frontier Asia and India are spearheading rapid change. Asia also has huge resources for innovation. For example, by 2030, China and India could account for more than 60 percent of science, technology, engineering, and math (STEM) graduates in major economies, compared with only 8 percent in Europe and 4 percent in the United States." (p. 49)

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IoT technologies and cyber-physical spaces also have the potential to fuel cooperative interactions between stakeholders, ultimately giving scope to feedback mechanisms for sustainable value creation (Kiel et al., 2017; Kuo et al., 2019; Taylor & Schroeder, 2014; Yee, 2017). With the majority of people living in (smart) cities by 2050 with digital devices and infrastructure that will generate tons of digitized data about dwellers and businesses' activities, which, if properly analyzed, "enables real-time analysis of city life, new modes of urban governance, and … more efficient, sustainable, competitive, productive, open and transparent cities" (Kitchin, 2013, p. 1). Consumers would become producers of data. These 'prosumers' could help reveal trends in order to monitor economic, industrial and social behaviors or magnitudes for real-time efficiency and decision-making.

Financial cooperation can lead to higher stability and fuel sustainable investment environments. In a roadmap for their essay compilation by Gill et al. (2007), the authors touch upon networks and regional integration by addressing a financial approach and ask whether East Asia could create a viable financial network in the region. Therefore, de Ocampo (2007) advocates for reforms strengthening domestic financial sectors to avoid investor panic and spillovers to neighboring economies. This calls for "greater engagement among the region's individual-country central banks. In fact, the Chiang Mai Initiative is a collaborative effort of the individual central banks" (ibid., p. 62). Regional cohesive institutional complementarities allow better access to venture capital that may spur innovation faster, especially in the high-tech field but also bears higher risks (Hoffmann, 2003; Wood, 2001). One can argue that big data analytics will produce higher levels of assurance in funding and investments, and that convergence of hybrid Asian market economies may piggyback on that potential (Carney et al., 2009; Hall & Gingerich, 2009). On the other side, capital coordination facilitates product market strategies which employ the collective goods it makes possible" (Wood, 2001, p. 249), generating lower social inequalities and more economic stability overall, especially in the field of medium-tech that many economies in the Asia Pacific could easily leverage at current development stages with particular regard to manufacturing bases in ASEAN.

However, Chinese companies might be a game-changer and outscore international digital competition easily due to their large scale of well-resourced

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funding channels. When the U.S.-based ride-sharing platform Uber went into China, they competed directly with DiDi, the local provider. What followed was a cutthroat competition by offering free rides to customers, thus, benchmarking the market and winning customers despite bankrolling their market share – the 'growth before profit' model (Srnicek, 2016). Despite having investors all over the world, being based in the world's most accessible capital market Silicon Valley, and raising $US4 billion, DiDi raised US$20 billion with state support and had Uber to exit the market (Brown, 2019). Chinese companies –being fundamentally well-resourced– may come into markets with new sets of rules and new ways of competing. Therefore, cooperation does not automatically entail a company's success, but cooperation within an ecosystem, for instance, DiDi incorporating services outside their core-business of ride-sharing, such as food delivery and payment services, may represent the collaborative aspect to survive in competition against other market players. Moreover, global rules and standards can propel innovation through ensuring more effective market competition "both at the macro-level of platforms and the micro-level of platform users" (Sawada et al., 2018). Thus, it could be argued that there is a need for unified regulations to make it fairer and easier for companies to collaborate in the face of the scope of Chinese big players. But also, China's digital rise goes hand in hand with a pushback in that ensuring personal data security, as trying to be achieved through the European Union's GDPR, for instance, might be at stake in terms of the potential of the existing legislation that the Chinese government could force companies to hand over data to comply with specific regulations (Shi-Kupfer, 2019).

2.5 Policy scope for digital trade

For industrial policymaking 4.0, unconcise definitions of digital products and services hamper enhanced policy streamlining on a global level. For instance, the World Trade Organization (WTO) keeps debating about the imposition of customs duties on "electronic transmissions" as the WTO vaguely defines digital products, and several countries have resorted to bilateral preferential trade agreements to clarify the context of electronic transmissions among them. For instance, Japan and Western countries in America and the EU have adopted the terms "digital product" or "delivery" as opposed to, for instance, Indonesia's definition as the carrier medium with digital data encoded on it (Cheng & Brandi, 2019). This is mainly due to the fact that

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industrialized countries are major exporters of digital products and strive for global commercialization whereas the greatest fear for weaker and emerging economies is the loss of policy scope to support their nascent digital ecosystems as well as forfeiting tariff revenues with an estimated 92 percent of global revenues lost by them (ibid., p. 3). However, a recent OECD working paper contests this perspective by highlighting customs on products that fall under WTO's category of "electronic transmissions" as unstable and relatively low source of revenue and as a burden to mainly domestic customers and general consumer welfare (Andrenelli & López González, 2019) [6], which would particularly hold true for emerging markets as net importers of software, whose gains through implemented AI products and software in their own production processes would boost efficiency and productivity in unfettered ways that may outweigh the shortcomings.

With a lot of growth and market opening potential, the trade policy discourse in the Asia Pacific is currently shaped by two multilateral free trade agreements: The Comprehensive and Advanced Trans-Pacific Partnership (CPTPP) and the Regional and Comprehensive Economic Partnership (RCEP), with the latter to be signed in early 2020 after negotiations started in 2012 (Reinsch & Caporal, 2019). They are seen as important drivers of market integration and form a fundamental building block of free trade and multilateralism (Chen & Lombaerde, 2019; Reinsch & Caporal, 2019). Therefore, member states' approach to digital trade within these multilateral frameworks may well reflect streamlined versions of the agreements in domestic data-related policy frameworks. The CPTPP, which formed after U.S. President Donald Trump withdrew from the initial Trans-Pacific Partnership Agreement (TPP) in late 2018, contains rather ambiguous definitions of digital products. Currently, Japan, Singapore, Vietnam, and Brunei are contracting states in Asia, and Australia, Canada, Chile, Mexico, Peru, and New Zealand outside of Asia. Chapter 14 of the CPTPP on electronic commerce deviates from WTO terminology and introduces "digital

[6] The OECD report by Andrenelli and López González (2019) applies welfare analysis and simulates forgone government revenues from tariffs as well as customer surplus, concluding with a positive net impact of tariff reduction on the economy (pp. 42-44). They suggest that when goods are digitized and no tariffs are levied, trade cost reductions and the government's forgone customs revenues are redistributed to the consumer, generally leading to a higher demand for digitized goods as well as enhancing digital infrastructures and supply chains.

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product" (CPTPP, 2018, art. 14-1) but, eventually, resorts to using the WTO's terminology using "electronic transmission" in the customs section (CPTPP, 2018, art. 14-3), leaving inconsistencies for CPTPP signatories in domestic policy formulation as well as for trading partners who are non-signatories (Andrenelli & López González, 2019). Similarly, RCEP signatories, including the ASEAN countries and their FTA partners China, Japan, South Korea, Australia, and New Zealand, usually strive for consistency with the WTO (Solís & Wilson, 2017). Areas of growing importance like e-commerce are covered by RCEP but were disputed, resulting in India withdrawing and leaving the disputed content out of the agreement. This is particularly disappointing because regulations on data localization are not included, thus, cross-border data flow for businesses etc. is not directly promoted, and unlike CPTPP, neither prevents customs duties on digital products (Reinsch & Caporal, 2019), which decreases customer welfare and demand for potentially productivity-boosting technology imports as shown in the OECD report by Andrenelli and López González (2019). Thus, RCEP surely gives leeway to its weaker signatories but fails to address the need to fill the gap of inconsistent digital (trade) policy frameworks across its members that are marked by different development stages and a digital divide. As a mega FTA comprising the largest consumer base by population and GDP globally (Lee, 2016; Reinsch & Caporal, 2019), RCEP could have displayed intra-regionally driven policy patterns with regard to setting digital standards for domestic industrial policymaking that would make an argument for the emergence of Asian Data Capitalism. However, with intersecting regionalisms of trade blocks, regulatory incoherence and grey zones could lead to conflicting issues around the digital trade of goods and services and impede administrative harmonization within domestic policy frameworks (Mashiko, 2020). Additionally, economic heavyweight China, which was originally excluded from the TPP, could particularly benefit from RCEP to strengthen not only its economic influence in the Asia Pacific region but also pose itself at the forefront of digital standards-setting if regulatory heterogeneity sustains. An argument can be made that this is likely to happen against the backdrop of deepening regionalization and China's ambitions in cross-border e-commerce cooperation that was added to existing ASEAN–China Trade Area protocols (ACFTA) as "a model for mutual benefit [and] win-win cooperation among developing countries" (Liang & Zong, 2019). So the RCEP agreement is not China's trade response to CPTPP, but an ASEAN-led initiative to

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contribute to economic integration in Asia. Nonetheless, CPTPP is convincing in that the agreed liberalization goes beyond the rules of the WTO and covers these emerging areas around digital trade that are not yet or not fully part of the WTO, for instance, CPTPP restricts software technology transfer (Froese, 2018). The introduction of such advanced trade rules is likely to impact future free trade negotiations or can even be considered a blueprint.

While digital trade offers inclusive elements of giving small and medium-sized businesses chances to enter and participate in production networks while it helps other businesses to expand, it also entails sensitive issues like cross-border data flows, collection, storage, and privacy. As a weighty and influential economic block and example of high economic integration, aligning with the GDPR provisions seems to be a vital measure for economies outside the EU in order to facilitate a seamless cross-border flow of information and trade. However, Mattoo and Meltzer (2019) find that "the GDPR reflects a specific balance between privacy and the economic and trade opportunities from data flows that is unlikely to be optimal for developing countries" (p. 771). Assumptions were made that pronounced protective regulations regarding personal data and information may impede innovation by hampering the exploitation of digital technologies' full potential, for instance, startups would be faced with high compliance and entry costs that ultimately reduce competition; however, suggestive evidence points to internet companies and e-commerce firms in particular who establish a system of trust through complying GDPR provisions and therefore acquire customers, users, and their data, as well as attracting investors for expanding business (Carrière-Swallow & Haksar, 2019; Rooney, 2018; Tan & Azman, 2019). For example, the CPTPP touches upon core principles that "each party shall allow the cross-border transfer of information by electronic means, including personal information, when this activity is for the conduct of the business of a covered person" (CPTPP, 2018, art. 14-11). It pertains in some form to the GDPR stipulation limiting the processing of data to information that have to do with the service or product provided (GDPR, 2018, art. 7). In fact, GDPR stipulations are largely reflected in the aforementioned free trade agreements and may represent globally common privacy principles. For instance, data collectors are generally accountable for the processing of personal data because with technology progressing towards the fusion of AI and the IoT, it can be a daunting task for individuals to detect and keep control over the capturing and processing of their personal information (APEC, 2017;

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Iphofen & Kritikos, 2019). Therefore, it is necessary to produce coherent and ethical policies that address and solve these issues in order to establish trust in global digital infrastructures beyond e-commerce as well, ultimately fostering the economic potential of the digital economy. In this endeavor, the APEC Privacy Framework was endorsed to "balance and promote both effective information privacy protection and the free flow of information in the Asia Pacific region" (APEC, 2017, p. 2), with privacy protection principles pertaining to OECD privacy guidelines that themselves are more or less based on the GDPR (Mattoo & Meltzer, 2019). For instance, the APEC Cross-Border Privacy Rules System was introduced in 2005 and updated in 2015 to implement the APEC Privacy Framework in order to effectively address data regulations through certifications that companies can obtain to demonstrate compliance and establish consumer confidence in online transactions. However, it does not match up to GDPR completely in terms of stipulations on mandatory data breach notification, for instance. Despite not being as narrow and detailed as GDPR provisions, the APEC Privacy Framework leaves greater policy scope especially for emerging markets and latecomers yet to be integrated, such as ASEAN's Cambodia, Lao, and Myanmar who are not APEC members but may not have the capacity to implement advanced data protection stipulations as laid out in the GDPR. Therefore, the APEC Privacy Framework may offer a better approach for the Asia Pacific to close the digital divide through a broader scope for digital policymaking whilst incrementally streamlining policy environments in the region for a balanced trade facilitation and consumer/privacy protection.

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Chapter 3. Country case studies

3.1 Singapore

3.1.1 Conditions for data-derived value

With a small population and limited availability of public data, Singapore falls behind in terms of domestic data as a potential resource for mining and up-scaling to translate these into internationally viable products based on personal data. However, the country has established itself as a strategic location for neighboring countries' data centers for Singapore does not lack in access to high-tech computing capacity; for instance, half of the Southeast Asian data centers are located in Singapore and a joint plan between Singapore bases Keppel and China's tech giant Huawei for expanding existing capacities includes blueprints of 20-floor high rise data centers in the face of energy and land resource challenges (Yu, 2017). The manufacturing industry accounts for about 20 percent of Singapore's gross domestic product and in terms of its ICT manufacturing base, Singapore's semiconductor industry has propelled the country's growth by large amounts and keeps pushing ahead in order to keep a competitive edge and upgrade the domestic production line despite its relatively small size (Singapore Economic Development Board, 2019). This has successfully been addressed by the government in that it created size-adequate technology-friendly conditions that would attract private investors to make Singapore an innovation hub in the region. Therefore, Singapore can provide the hardware in the form of data-processing facilities and semiconductors, especially when partnering up with regional economic big players in such as China's Huawei. Despite recommending restrictions and export controls to Chinese manufacturers, namely Huawei, the Center for a New American Security views Singapore as a prime strategic partner for mutually beneficial cooperation regarding semiconductor manufacturing, AI hardware, and research collaboration (Rasser et al., 2019). The Smart Nation and Digital Government Office (SNDGO) realized that an established supercomputing infrastructure is crucial to AI research and the commercial use of data (SNDGO, 2019, pp. 42-49) because now, Singapore hosts only 2 of the top 500 supercomputers in the world but has far more capacities to do so (Strohmaier et al., 2019). Nonetheless, in tandem with a population, although low in numbers but highly-skilled, the hardware can be complemented with the software developed by the professional workforce and on the basis of data provided by multinationals that are based in Singapore. To leverage the potential for Singapore

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to become an AI and IoT hub in the region, the need for strengthening Singapore's skilled workforce as its valuable resource as well as enabling public-private collaboration to explore new business fields is well-addressed and granted by local regulatory authorities.

3.1.2 Institutional framework

In the absence of natural resources, the Singaporean government sees its future in data as a new resource, and actively strives to become an internationally recognized AI hub. The government aims to create an AI ecosystem based on the interplay of industry and science in an attempt to educate and provide the respective human resources needed to propel an innovative digital economy. The overarching *AI Singapore* initiative interconnects participants' technology promotion ambitions, including the leading National Research Foundation (NRF), the SNDGO, the Economic Development Board, the Infocomm Media Development Authority (IMDA), and state-owned SGInnovate promoting deep tech startups, as well as the leading IT healthcare analyst Integrated Health Information Systems (NRF, 2018). *AI Singapore* is a top political priority and is coordinated by the SNDGO at the Prime Minister's office and the National Research Foundation (NRF), a subordinate ministry to the Prime Minister, in order to improve Singapore's capacity for data processing and AI applications (NRF, 2018). It is aiming to address major societal challenges, prepare human capital and industries for technological change and relies on the Digital Government Blueprint, the Digital Readiness Blueprint and the Digital Economy Framework for Action, with the latter emphasizing the four emerging core technologies AI, cybersecurity, immersive media e.g. virtual reality, and IoT (AI Singapore, 2018). Specifically, the initiative consists of the following programs to train and increase the domestic talent pool: *Fundamental Research, Grand Challenge, 100Experiments, AI Apprenticeship, AI For Industry, and AI For Everyone* (SNDGO, 2019).

With an economic portfolio of a large banking and insurance sector, areas that will definitely be hit by job displacement through smart algorithms that take over financial services, Singapore is facing the future of the digital economy not only by leveraging this potential but also by taking the social impact into account, offering retraining programs and such (Araral, 2019). Nearly 21 percent of full-time

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employees could be displaced through increased use of data-fueled technologies such as AI over the next ten years – a percentage higher than in other ASEAN countries (Tan, 2018). This calls for governmental efforts to promote understanding and acceptance of AI in the population while leveraging the potential of these emerging technologies. For instance, when the five-year initiative *AI Singapore* was rolled out in 2017, the program *100Experiments* was launched in which companies are encouraged to submit issues for which there does not exist any standardized AI solution yet, but one could be easily worked out, and thereupon, companies are referred to AI developers for collaboration through funding mechanisms provided by the InfoComm Media Development Authority (AI Singapore, 2018; IMDA, 2017a, 2019a) and the Smart Nation and Digital Government Office (SNDGO, 2019). Moreover, *AI Singapore* offers a retraining program called *AI for Everyone* to provide up to 100,000 Singaporeans with information on how to use AI in their own businesses and in their daily lives, which is financially supported by IMDA (2019a) in collaboration with Microsoft (Araral, 2019). Nonetheless, this may not be sufficient in eradicating fears of less tech-savvy parts of the population who may not be able to access such programs.

The NRF is investing around US$107 million to create a platform for Singapore-based research institutions and the AI talent pool in order to exchange knowledge, network, develop skills, and strengthen a domestic data-fueled business ecosystem (NRF, 2018; Remolina Leon & Seah, 2019). Undoubtedly will governmental funding consolidate the nation's progressive tech-savviness. However, in international comparison, the amount is rather small. Therefore, *AI Singapore* takes an application-oriented and commercial approach to big data analytics capacities in that the initiative is designed around the objective to foster and consolidate cooperation between industry and research in order to meet primarily industrial needs (IMDA, 2017a, 2019a; SNDGO, 2019). This is also the case in China, as discussed in the respective case study, which gives Singapore great opportunities to collaborate and receive Chinese investments –also within RCEP and ASEAN-China FTA frameworks– that have been growing over time as China expands into new market and fields, namely AI.

Singapore's InfoComm Media Development Authority (IMDA) will most certainly play a crucial role in Singapore's successful transition to a data-driven

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ecosystem of enterprises, Singapore-based multinationals, and the local workforce as societal stakeholders.

> "As a statutory board in the Singapore government, [IMDA] seeks to deepen regulatory capabilities … and regulate data protection in Singapore through the Personal Data Protection Commission, which will be part of the IMDA. This will ensure that public confidence in the private sector's use of personal data is safeguarded.
> [IMDA aims to create] a dynamic and exciting sector filled with opportunities for growth, through an emphasis on talent, research, innovation and enterprise." (IMDA, 2019a)

Through regulatory power, the IMDA represents an authority that has the potential to truly bring together private and public stakeholders by enabling businesses and empowering societal actors. For instance, the authority provides access to the digital workforce platform JobKred that conducted labor market research in collaboration with UNESCO, the World Bank, as well as the Asian Development Bank (IMDA, 2019b). The vast amount of workforce data gathered has led to strong algorithms to match employees in organizations and companies to "identify future-ready skills and create dynamic competency frameworks to guide … personal development" as well as giving "AI recommendations to personalize their learning and receive career recommendations" (IMDA, 2019b, profile description). This complements the argument in favor of government action to strengthen Singapore's most valuable resource – the highly-skilled workforce. As a country with a distinguished and strong knowledge-based economy, Singapore emphasizes its ambitions on the training of professionals in the field of AI. As part of IMDA's Industry Transformation Map, a strategic roadmap towards the digital economy, the ITC industry is to be further prepared for the transition with plans to establish and advance a highly-skilled workforce in the field (IMDA, 2017a). For instance, the initiative *SkillsFutures* and the TechSkills Accelerator (TeSA) aim to diversify ICT skills and knowledge among the population and, thus, add 200 professionals to the pool of domestic talents in data-related fields until 2021 through the AI Apprenticeship Programme (IMDA, 2017). There are a variety of initiatives to propel technology adoption and data-fueled innovation. The Smart Nation Initiative aims to channel investments towards establishing a firm technological and digital infrastructure to collect and use data to support the development of solutions for urban challenges and their

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commercialization (SNDGO, 2019).

3.1.3 Regulation and commercialization

With state support for young businesses, the Singaporean startup ecosystem ranks 12th on a global scale as of 2017 and was valued at US$11 billion, superseding the global average of merely $US4.1 billion (RSM Global, 2018, p. 95). State support comes, for instance, in the form of 75 and 50 percent exemptions on the first incomes above S$100,000 (~US$75,000) (RSM Global, 2018, p. 94). In addition to the 2017 *SME Go Digital* initiative supporting SMEs in strengthening their digital capabilities, the *Accreditation@SGD* initiative supports early-stage start-up companies with technical applications. IMDA offers companies participating in *Accreditation@SGD* improved access to innovative financial technology projects and decided to support AI speech recognition developers for their long-term entry into the global speech recognition market (IMDA, 2017b). As a third-party evaluation system, "increased business traction has also helped provide assurance and market visibility for investors" so that "fifteen accredited companies had secured $68M [~US$50 million] in new growth capital during or after accreditation" (IMDA, 2017b, p. 2). One of the accredited startups called Tarkomatic leverages the aforementioned fusion of AI and IoT technology, the AIoT, touching upon the new customer experience (Microsoft Asia News Center, 2020). Upon giving their consent, participating users are identified and located when they enter a shopping mall in Singapore through facial recognition and a network of smart sensors. Through the fusion of IoT and AI technology, the algorithm analyses users' interests, matches them with available retail offers, sends out personalized messages, guides the potential customer to the store and adapts digital advertising signage along the way and, eventually, informs the retailer of the customer's arrival to offer personalized retail experience. The startup offers an entire "customer service ecosystem" in the cyber-physical dimension of the IoT and IIoT. Moreover, as a part of the *AI Singapore* initiative, a program called *AI for Industry* targets skill development in data mining and big data analytics for engineers, managers, and executives who already have some prior technical knowledge to enhance the domestic talent pool and boost overall productivity and innovational conception in the existing workforce. Therefore, the above-mentioned program called *100 Experiments* serves as a platform for AI researchers and developers to connect

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with industrial stakeholders who want to address their specific challenges through big data analytics solutions. Companies can submit their issues upon which they are matched with AI experts. The initiative is a "collaborative model to co-create AI solutions" funding the project equally with participating companies up to S$250,000 (~$US185,000) in an attempt to a) overcome the high-cost barriers for companies to invest in AI solutions for their operations and b) deliver a viable product as a solution to the initially stated problem within 18 months (AI Singapore, 2018).

Regarding public procurement, which denotes the public sector as a user of data-driven solutions, the government is increasing the demand for cutting-edge technologies, thereby promoting innovation. According to the World Competitiveness Index, Singapore ranked fifth among 137 countries in 2017-2018 regarding government procurement of advanced technology products (World Economic Forum, 2018, p. 263). As a comprehensive part of the *Smart Nation* initiative, the government actively propels the transition towards e-governance by defining digitization and data generation for AI solutions and concrete applications, such as digital payments and digital signatures, as fundamental components of public service transformation. For a successful transition, the initiative includes training for public servants in digital literacy to establish a smooth interface between public authorities and citizens. Singapore as a 'smart nation' is supposed to co-create the digital economy jointly with both Singaporeans and businesses in order to respond to societal and economic needs through facilitating the adoption of technology by everyone. Commercialization, therefore, takes all societal stakeholders into account because it is their data that drives the process of co-creation. Since access to large data sets is indispensable for machine learning and training AI applications, plans were announced to expand access to public data through a governmental platform as well as motivating businesses to share information responsibly with each other to solve common problems in a collaborative manner (Araral, 2019; SNDGO, 2019).

However, regarding the access to and ethical use of personal data for business operations, the regulatory framework becomes consecutively less restricted whilst the security of copyrights is still ensured. Regarding the adoption of data-fueled AI solutions by the private sector, the government identifies collaboration between industry and research as a key factor for success in big data analytics. As text and data mining are essential to the development of AI, this topic became part of the 2016 public consultation on changes to the Copy Right Act. The Department of Justice

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proposed an exception in the Copy Right Act that would allow copying of copyrighted data and content for the purpose of data analysis (Ministry of Law Singapore, 2016). In terms of data protection, this means, in particular, that the Personal Data Protection Act of 2012 was examined for preferential arrangements. So far, it legitimized the needs of companies to collect and use personal data and regulated the responsible use of data. As of 2019, the Ministry of Law Singapore (2019) concluded to amend the Copyright Act and "update Singapore's copyright regime to better support creators and the use and enjoyment of creative works in the digital age" (paragraph 1).

For the Singaporean government, the ethical use of data plays a central role in AI applications. During a public consultation with the Personal Data Protection Commission (2017) regarding the treatment of personal data in the digital economy, concerns were voiced that technological progress may give rise to unprecedented machine intelligence that could de-anonymize previously anonymized personal data, posing new questions regarding AI and how to forge it in the present for sustainable use in the future. In a speech by the Minister for Communications and Information S Iswaran at AI Singapore's 2018 anniversary event, he announced that an advisory council on the ethical use of AI and data should be formed (Iswaran, 2018). Thereupon, the Personal Data Protection Commission of Singapore issued a discussion paper on the responsible application of AI and use of data, stressing the principles of transparency; thereupon, Singapore Management University received a US$3.3 million research grant and opened the Center for Artificial Intelligence and Data Governance to assist the Advisory Council on the Ethical Use of Artificial Intelligence in assessing and exploring the societal opportunities and risks of emerging data-fueled technologies as well as their impact on ethics and the workforce (AsianScientist, 2018). Moreover, the Personal Data Protection Act is less strict than the GDPR, in particular on matters of consent provision for data collection and handling as well as 'sensitive personal data' for which it has no definition. It's diverting from Western standards reflected by GDPR is directly stressed in that information is considered sensitive "based on the unique social norms, culture, public expectation and organisation's understanding of a particular country … the PDPA is enacted for economic purposes … to enhance Singapore's competitiveness" (Yeong, 2019, p. 42). These notions reflect the market-driven character of Singapore's approach to data protection policies as opposed to a Western human rights-based

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perspective. This would rather fit in the VoC category of liberalization in a sense of 'less restriction' but not necessarily less 'government'. This may also reflect the scope of the general lack of coherent definitions across the region as discussed in chapter 2.5 on policy scopes for digital trade.

3.2 Japan

3.2.1 Conditions for data-derived value

Few governmental strategies to link artificial intelligence with the future of their country has been formulated as clearly as by Japan. This response is due to the fact that Japan realized it would quickly fall behind in the digital economy, as expressed by the Ministry of Economy, Trade and Industry (METI) in 2016:

> "… consumers [in the 1970s and the 1980s] required highly technological products, and technologies themselves created value. However, customer needs have become diversified due to progress in globalization and market maturity, and commoditization of individual products by the use of IT has made it difficult to create value only with product performance. Nevertheless, Japanese companies have not been able to respond properly to environmental changes for acquiring new customer value." (METI, 2016, p. 1)

Therefore, one of the main goals of premier Shinzo Abe's endeavors is to realize Society 5.0 beyond industry 4.0 through his economic revitalization program coined Abenomics, which integrates society and human life with cyber-physical spaces through various government initiatives (Government of Japan, 2018). There are two key ambitions of Shinzo Abe's economic strategy Abenomics: sustainable growth and the transition to the super-smart society 5.0 where cyber-physical spaces are highly integrated with people's lives in order to leverage economic progress to solve social issues, for instance, job displacement poses less of a problem regarding that automation and smart devices give hope to actually solve issues around Japan's aging society (Waldenberger, 2018).

Immigration, among other reasons, is very limited so that the digital economy with smart connected devices producing data on people's needs (human-centered) is seen as one of the remedies to the shrinking labor force. Thus, fundamental research budgeting prioritizes research fields in productivity gains, health care, well-being, mobility, and security; especially medical-related fields and elderly care are adopting Japan's human-centered approach to artificial intelligence as a service (AIaaS) that exploits data for primarily social reasons coupled with its economic rationale

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(Strategic Council for AI Technology, 2017). In Japan, a sociocultural driver for AI adoption in these fields may be the people's cultural open-mindedness towards interactions between humans and machines - something that Western cultures are markedly having more struggles with (Strategic Council for AI Technology, 2017). Japan does indeed have strong potential to leverage big data, with one of the largest amount of internet users in the world, though aging, 36 of the most powerful computing facilities in the world with Japan-built AI Bridging Cloud Infrastructure among the top ten (Strohmaier et al., 2019), all of which gives the country access to a lot of high-quality public data and computing capacity. Additionally, The Ministry of Finance recorded in its draft for the fiscal year 2019 US$270 million funding for promoting medical ICT "for building the efficient medical care provision system by standardization of electronic health record and introduction of online qualification check" (Ministry of Finance, 2019a, p. 11) which was stocked up in the 2020 budget draft to annually US$700 million (Ministry of Finance, 2019b, p. 9).

So far, the private sector in particular has made the bulk of research spending. For AI only, the Japanese government's draft budget in 2018 was announced at US$720 million, which falls short in the face of other strong economies in the region such as China with US$4 billion government funding; however, Japan's private sector invests about US$5.5 billion per year specifically into AI-applications, which roughly equals Chinese more or less private companies' investments (Kyodo, 2018). Additionally, Japanese corporations and multinationals have a strong position in hardware but lack in innovative software development and startup culture. This may be due to conservative employment patterns known as the 'salaryman' system with remuneration upon seniority instead of performance-based salaries, which renders many younger people and employees incapable of making a living in freelance jobs that would be needed for innovative business models or startup ecosystem.

3.2.2 Institutional framework

Shinzo Abe's party enjoys a majority in both houses of parliament, which is conducive to effectively implementing Society 5.0, with ministerial departments including AI in their strategies, for instance, through the Integrated Innovation Strategy and the Japan Revitalization Roadmap (Waldenberger, 2018). The institutional parameters and conditions for innovative R&D and budget allocation are set out by the Council for Science and Technology and Innovation (CSTI) chaired by

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the prime minister and the ministries following the CSTI guidelines. Abe founded the Strategic Council for AI Technology in 2016 to coordinate ministries' and their respective research centers' actions, including the Ministry of Interior and Communications, the Ministry of Education, Culture, Sports, Science and Technology, and the Ministry of Economy, Trade and Industry. The council also includes ministry representatives for health and work, land and infrastructure, transport and tourism, and agriculture and fisheries, as they have large amounts of data (Mitomo, 2020; Strategic Council for AI Technology, 2017). In addition to promoting R&D, the council coordinates with AI-using exit industries and promotes the social fields of AI application. This strategy calls for an industrialization roadmap that combines experiences of industry, science, and the government to derive consistent approaches to research, commercialization, and social AI implementation.

Japan's AI strategy and roadmap does indeed target big data analytics as a potential to not only commercialize on but also use for social benefits. For instance, the *Next-generation AI x ICT Datability Strategy* serves …

> "to collect valuable and strategic data from such key fields as linguistics, neural information, and spatial information, as well as various workplace data … that will be the driving force behind the social implementation of next-generation AI, and to promote the arrangement of conditions (ICT datability) to link data sets from different fields and make them available for use by AI securely and conveniently for value creation." (Mashiko, 2020, p. 188)

In the light of this human-centered approach, the Advisory Board on Artificial Intelligence and Human Society was formed under the auspices of the Council for Science and Technology and Innovation to take ethical, social and economic concerns into account before formulating further steps in its implementation. The board agreed on the advantages of AI integration in the very fundament of society outweighing the shortcomings in that new forms of interactions between humans and machines give scope to rethinking the concept of humanity and reconfigure the societal fabric towards more equality and inclusiveness (Advisory Board on Artificial Intelligence and Human Society, 2017).

Additionally, public university research is underfunded and internationally isolated, and translating academic output into industrial input is relatively low. Nonetheless, this issue has been addressed by the Ministry of Economy, Trade and Industry (METI, 2016, 2018) through the cross-appointment system which allows researchers and developers from public and private sectors to work part-time in the

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respective other sectors. Moreover, the METI also disclosed that the flow of international research grants into innovative projects was limited and that in terms of disruptive technologies like AI, "each country has been competitively making all-out efforts for R&D, while incorporating domestic and foreign technologies and knowledge; … the number of researchers in Japan is only 13 percent of that in major countries" (METI, 2016, p. 2). The immigration bureau revised the points-based preferential immigration treatment system in 2017 in order to attract highly-skilled foreign researchers and personnel into Japan by allowing long-term stays, granting the right to hold multiple occupations and a work permit for partners (Immigration Bureau of Japan, 2018). Also, incentives were set out for universities to engage more closely with the private sector. Additionally, deregulation has been implemented geographically in Strategic Special Zones to decentralize AI research and development in favor of economically underdeveloped regions.

3.2.3 Regulation and commercialization

Pertaining to the principles of Shinzo Abe's economic strategy, the commercialization of big data applications and AI targets sustainable growth and the transition to the super-smart society 5.0 where cyber-physical spaces are highly integrated with people's lives (Waldenberger, 2018). Japanese corporations and conglomerates have a strong position in hardware but lack in innovative software development and startup culture, partly due to traditionally high levels of risk aversion and the 'salaryman system' as discussed above. Having realized that "Japanese companies have not been able to respond properly to environmental changes for acquiring new customer value" (METI, 2016, p. 1), the regulatory framework for the treatment of data was particularly targeted since it stands at the core of the digital economy. Grey areas in the law were tackled in order to clarify legal conditions for the sake of predictable and stable economic activity in Japan and abroad. Mashiko (2020, pp. 192-193) points out that the three most relevant acts were amended: The Personal Information Protection Act, The Basic Act on the Advancement of Public and Private Sector Data Utilization, and the Copyright Act.

Amendments of The Personal Information Protection Act came into force in 2017 and included a definition of personal information, upon which a system for anonymizing information was set up and regulations on personal data provision to

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third parties overseas introduced (Personal Information Protection Commission Japan, 2016; Shin, 2019). As for international integration, Japan's object in view is similar to the GDPR set out by the European Union in order to adjust Japan's data protection law with particular regard to establishing globally valid standards for personal information and AI guidelines, not least due to the EU-Japan Economic Partnership agreement endorsed in 2019, with both parties deeming each other's data and information protection as equivalent (Mashiko, 2020; Personal Information Protection Commission Japan, 2018). To standardize treatment and handling of personal information of EU citizens and Japanese citizens transferred between the two areas, the Personal Information Protection Act was further revised "for the purpose of conducting mutual and smooth transfer of personal data between Japan and the EU" (Personal Information Protection Commission Japan, 2018, p. 1). In May 2017, it was supplemented in order to promote the collection and sharing of data provided that these are processed in an anonymized form with revisions largely intersecting with the European Union's GDPR, leading the EU to categorize Japan as a country with privacy standards similar to those in the EU (Shin, 2019; Takase, 2017). The principle of reciprocal adequacy was incorporated in that EU-based and Japanese companies are liable to recourse within their respective legislation even if data privacy violations are asserted by an entity from the other area (Simmons, 2019). An advantage of connecting globally through common standards in data privacy is that Japan, unlike China in this regard, can export its AI products to EU member countries without legal hurdles. If Japan successfully supplements its hardware focus with skills in software development, the equalization of personal data protection laws with EU regulations bears many prospective advantages for future trade between digital economies. Through the anonymization of personal data, which is data that cannot be used to identify an entity, their legitimate distribution enables businesses to leverage data with regard to developing competitive big data applications. Moreover, reciprocal adequacy embodies a trust mechanism to legally secure and expand digital supply chains between Japanese companies and those from outside with streamlined legal conditions regarding data protection. As a CPTPP and RCEP member committed to the APEC Privacy Framework, this could entail repercussions on data protection regulations in regional agreements and negotiations as Japan is bolstering its influential sphere in the Asia Pacific as a strategic and somehow more stable partner than China with particular regard to ASEAN countries (Wallace, 2019).

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Similarly, the amended Copyright Act gives leeway to the economic utility of copyrighted data in that these can be duplicated for third party information analysis such as training AI algorithms for commercial applications (Mashiko, 2020; Mitomo, 2020). As of January 2019, the extension of the copyright by three new articles went into effect because the government has taken note of the importance of access to data for companies to leverage and innovate on. Japan took it a step further and modeled additional amendments of copyright law to include content created by AI systems into the 'fair use' framework. The amendment allows usage and further processing of data, such as data mining or duplication of protected contents, by commercial and non-commercial AI systems to learn and develop sound algorithms even without copyright holders' consent if no harm is done to the copyright owner, thus, pertaining to the 'fair use principle' [7] (European Alliance for Research Excellence, 2018; Matsuda, Kudo, & Konishi, 2019).

Adhering to the overarching concept of the Japanese Society 5.0, the Basic Act for the Advancement of Public and Private Sector Data Utilization follows the vision expressed in the government's declaration to become the most advanced IT nation in the world (Ando, 2020). Plans involve the entire administration to be digitized and public and private data will be made available to the private sector (Government of Japan, 2018; Granrath, 2017). However, regarding public procurement in the light of these digitally holistic ambitions, the Japanese government ranked 23rd among 137 countries in 2017-2018 regarding government procurement of advanced technology products, according to the World Competitiveness Index (World Economic Forum, 2018, p. 161). Nonetheless, the Basic Act for the Advancement of Public and Private Sector Data Utilization has a strong focus on Japan's pressuring problems of an aging society that is answered by a market-driven approach. It puts forth basic principles of further efforts regarding open-sourcing and effective use of public and private sector data in order to incrementally realize society 5.0 through smart business solutions that would provide citizens in Japan with comfortable environments and smart

[7] Interestingly, Japan modeled its fair use principle after United States law and enshrined it as such in its legislation even after the United States withdrew from former TPP negotiations (European Alliance for Research Excellence, 2018), clearly marking Japanese efforts in creating, setting, and pertaining to internationally common copyright standards, as well as potentially hedging towards U.S. regional integration despite ongoing U.S.-China rivalries.

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infrastructures to cope with low birthrates, aging society, and the socioeconomic impact they entail (Mashiko, 2020).

Alongside legal changes and liberalization in data-processing and utilization, a law came into effect in 2018 to designate geographically defined National Strategic Special Zones in locations across the country with tax breaks for resettlement and relaxed or discarded regulations that allowed companies to carry out government-approved pilot projects in regulatory sandboxes, that is deregulated test environments to try out new business models and generate necessary data for further research, commercialization, or nationwide usage, including permissions for robot-human interactions in the streets in Fukuoka, or AI-automated robot taxis in Fujisawa City for disaster or life support services (Shimpo, 2018). Upon success, deregulation could be expanded across the country. The sandboxes do not only provide the space for innovative thinking and creative failure, but they also strengthen structurally weaker regions outside the big metropolitan areas.

3.3 China

3.3.1 Conditions for data-derived value

In 2015, China piggybacked on the idea of the 4.0-concept and hence introduced its *Made in China 2025* industrial upgrading strategy. However, the country's industry is more heterogeneous than Western economies' in terms of its technological capacities. There are billion-dollar corporations with high technology and many small and medium-sized enterprises that have not yet reached levels of the third industrial revolution (Ferenzy, 2018). Therefore, China's 2025 strategy aims to achieve a large-scale improvement of general automation and notably its competitiveness in the production and manufacturing – a hint towards maintaining certain levels of the "factory Asia" model but with ambitions to catch up in core technologies and move towards indigenous "value-added factory Asia" (Kam, 2017).

Against the demographic backdrop of the world's largest population and growing internet penetration rates, the potential for a vivid digital ecosystem is undoubtedly high and complemented by a state system that allows the government targeted data collection and usage for systematic analysis and information extraction to an extent greater than anywhere else in the world. Despite ranking very low for availability and quality of public data (Lee, 2018), its sheer size in population and

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landmass provides China with an advantageous position in generating data, developing as well as applying data-driven solutions to a variety of settings. With 840 million internet users in 2019 and predicted increase to 975 million by 2023 (Statista, 2019), all of which already generate a massive data volume that concentrates in a few major Chinese technology companies, namely the ecosystems around Tencent and Alibaba. China's rapid socioeconomic transformation has helped many Chinese companies like these to thrive in environments of a growing Chinese middle-class with increasing income and the purchasing power to satisfy consumption aspirations and pent-up demands for financial services (Lee, 2018; Naughton, 2018). Moreover, the transformation occurred all amidst the proliferation of internet technologies and mobile phones, which turned out to be the major factor behind the success of many Chinese big tech companies who could reach out to millions of people at a very low cost and channel their resources into generating innovative forms of namely financial technologies (fintech) and e-commerce (Ferenzy, 2018). Moreover, the rise of Chinese tech companies is largely due to capable technocratic policymaking and governmental regulations (Naughton, 2018). As for fintech, for instance, regulations were relaxed to an extent that these companies could leverage the potential of internet finance without greater impediments in tandem with protectionist policies as a shield against foreign competition, which gave them scope to grow into "National Champions" who enjoy subsidies and government-backed investments (Ferenzy, 2018).

In spite of its semiconductor industry base lagging behind in terms of precision and state-of-the-art chip production, "China is adopting a 'catch-up' approach in the hardware necessary to train and execute AI algorithms" (Ding, 2018, p. 4). It now hosts 208 out of the world's most powerful 500 supercomputers, the largest amount of supercomputers in the world, with Sunway TaihuLight and Tianhe-2A in Wuxi and Guangzhou, respectively, among the top ten (Strohmaier et al., 2019). Also, as of 2018, China ranked with 1,011 out of 4,925 monitored AI-enterprises second after the U.S. with 2,028 (Tsinghua University, 2018, p. 46).

3.3.2 Institutional framework

Since 2013, China has released various policies addressing issues around big data technologies and AI, including the 2013 *State Council Guidelines on Promoting the*

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Healthy and Orderly Development of the Internet of Things, followed in 2014 by the *State Council Notice on Issuing Made in China 2025*, the *State Council Guidelines on Promoting the "Internet+" Action*, and the *State Council Notice on Issuing the Action Outline for Promoting the Development of Big Data*. Thereupon in 2016, the *Thirteenth Five-year Plan on National Economic and Social Development*, and State *Council Notice on Issuing the "Next Generation Artificial Intelligence Development Plan"* were released in 2017 with specific target development directions and priority areas of China's AI development (Tsinghua University, 2018).

For instance, immediate guidelines for the industry stating to put AI at the core of socio-economic development throughout the digital transition were released in form of the 2016 Chinese Three-Year Guidance for Internet Plus Artificial Intelligence Plan and backed by the Three-Year Action Plan for Promoting Development of a New Generation Artificial Intelligence Industry. The latter specifically sets out the need for an advanced public support system to drive growth, innovation, and breakthroughs in AI, but in return prompts companies to accelerate IoT/IIoT development including network hardware and software to create a next-generation internet infrastructure for smart factories and smart devices capable of video image identification or service tasks (Ding, 2018; Sirui, 2019). The Ministry of Industry and Information Technology (MIIT) is the respective body in charge of overseeing progress and make adequate adjustments.

The new national AI development strategies represent an integral part of the national development strategy to realize president Xi Jinping's Chinese Dream. AI-related strategies, such as *Internet+* and the *AI Three-Year Implementation Plan*, are funded by the State Development and Reform Commission, the Ministry of Science and Technology (MOST), the Ministry of Industry and Information Technology (MIIT), and the Cyberspace Administration of China. Moreover, the State Council's AI plan provides for establishing a new office under the direction of the MOST to direct full responsibility for implementation. The State Council issued the guidelines and the MOST thereupon announced to launch the implementation of the National AI Development Plan with its objectives that involve the major Chinese tech giants as the chosen national heroes to assist in datafication and platformization: Baidu for an autopilot AI open innovation platform; Alibaba for building a smart city AI open innovation platform; Tencent for medical images AI open innovation platform; iFlytek for intelligent voice AI open innovation platform.

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Traditionally, partnerships involving strategic assets and sensitive information have been reserved for China's state-owned enterprises, but policymakers have realized that rapidly advancing big data and AI capabilities are developed outside the scope of traditional state-owned enterprises.[8] This approach to advancing digital infrastructures aims to advance leading companies and platforms to emerging as regulatory stakeholders in the process (Chen & Qiu, 2019). In doing so, the capabilities of private firms are tied closer to the Chinese government's long-term visions and sphere of influence as articulated in the New Generation AI Development Plan. Digital governance is cast to big tech giants that get special roles but, at the same time, are expected to serve as platforms for others (Chen & Qiu, 2019; Larsen, 2019). The "Guiding Opinions of the General Office of the State Council on Promoting the Healthy Development of the Platform Economy" (The State Council, 2019) were issued in August of 2019, emphasizing that the platform economy is a new way of organizing productivity and a new driving force for economic development:

> "It plays an important role in optimizing the allocation of resources, promoting cross-border harmonious development and mass entrepreneurial innovation, promoting industrial upgrading, expanding the consumer market, and especially increasing employment. It is necessary to adhere to the guidance of Xi Jinping's thoughts on socialism with Chinese characteristics in the new era … while continuing to stimulate market vitality. Increased policy guidance … and the establishment of innovative monitoring concepts and methods are required … to adapt to the characteristics of the development of the platform economy and issues that may emerge as well as creating a fair market environment for competition." (The State Council, 2019, paragraph 1, author's own translation)

The platform economy and AI as the underpinning technology for China's development objective to firmly establish China as a global innovation center in AI by 2030, emphasizing that all related industries should generate an output value of one trillion Renminbi, approximately US$150 billion (Ding, 2018; The State Council,

[8] Yin and Li (2019) note that state-ownership –as opposed to state affiliation– is generally rather rare among Chinese Internet companies with only a few having shares held by the government; larger and globally-oriented private Internet companies, however, show more distinguished forms of government affiliation, not least because of preferential treatments they enjoy on higher and more resourceful administrative levels. Through this channel, the PRC government can still exercise their influence on Internet companies' development and steer technological progress it deems necessary to excel digitally and globally.

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2017). Also, development and gross output benchmarks have to be achieved incrementally by 2020, 2025, and 2030.[9] At the same time, it serves the comprehensive focus of intertwining technology, economy, society, and the army, thus, to improve productivity, social efficiency, and national security (Shi-Kupfer, 2019).

3.3.3 Regulation and commercialization

The sheer market size of China provides big players such as Alibaba, Baidu, and Tencent with great potential for AI applications on a large scale. This creates favorable conditions for a data-driven development of their business ecosystems in several ways. Firstly, the large-scale market is attractive for investors which shows through the fact that China follows second after the U.S. in terms of AI startups (383 as of 2017) with the worldwide highest funding in AI startups, in general, coming from within China itself before the US (Lee, 2018; Varadharajan, 2017). With regard to this, China's current position as one of the leading global AI hubs is mainly due to private investments in application-oriented R&D. This funding pattern arose in tandem with the government's efforts in bringing together companies and universities by cutting public funding to stimulate universities to go seek private third-party funding of research in the course of opening reforms that began in the 1980s (Chen, Sanders, & Wang, 2008). Thus, application-oriented R&D for commercialization was prioritized over basic research which the government in retrospect considered as a necessary means to catch up lay the foundations for future AI development and research. However, what is unneglectable is the fact that Chinese patents regarding AI and deep learning skyrocketed and overtook the US by far (Lee, 2018).

Application-oriented artificial intelligence systems are very likely to be successfully commercialized in China, however, it is not so clear whether this success holds for international commercialization. On the one hand, Chinese companies enjoy

[9] 1) By 2020: core AI industry gross output > RMB 150 billion (USD 22.5 billion)
AI-related industry gross output > RMB 1 trillion (USD 150.8 billion)
2) By 2025: AI industry gross output > RMB 400 billion (USD 60.3 billion)
AI-related industry gross output > RMB 5 trillion (USD 754.0 billion)
3) By 2030: core AI industry gross output > RMB 1 trillion (USD 150.8 billion)
AI-related gross output > RMB 10 trillion (USD 1.5 trillion)
(Ding, 2018, p. 10)

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great benefits and advantages from a relatively highly protected domestic market with regard to global competition, and the Chinese government is furthermore planning to tighten its grip even more and increase control and influence on domestic big players in tech sectors, for example, through party committees to be formed in companies (Ding, 2018). On the other hand, a disadvantage might be posed through the quality of the data gathered and analyzed by Chinese businesses since they are very specific with regard to their locale and linguistic focus, which is enhanced by the censored intranet characteristics of the Chinese internet (Webster, Creemers, & Triolo, 2017). In tandem with growing consciousness in the West regarding data privacy and data usage as pronounced through the European Union's GDPR, it remains unclear whether Chinese methods regarding data-handling and usage can be applied in these markets to gather data and internationally commercialize home-grown solutions developed under Chinese data protection regulations.

To tackle questions arising from this ambivalence, the China Electronic Standardization Institute put forward ideas to create technology standards regarding AI applications and security-related issues in order to be at the forefront in establishing a structure of global governance regarding AI development and application (Lee, 2018; Varadharajan, 2017). Therefore, the Standardization Administration of the People's Republic of China is already a member body of the International Organization for Standardization's (ISO) subcommittee ISO/IEC JTC 1/SC 42 which is "responsible for standardization in the area of artificial intelligence … provid[ing] guidance to JTC 1, IEC, and ISO committees developing Artificial Intelligence applications" (ISO, 2019). Working Group 5, for instance, is solely led by a Chinese team and focuses on "standardization in the area of computational approaches and computational characteristics of AI systems" (ISO, 2019).

To move beyond innovation and induce a true data-revolution for successful commercialization, China's strategy seeks to not only promote AI applications but fundamentally change the economic ecosystem around them by modernizing its industrial base akin to industrial 4.0 revitalization endeavors in Japan, supporting new ones, and transform the way people integrate with them, for instance, open-sourcing state data should provide the data necessary to build platforms for further enhancement of existing (cyber-)physical infrastructures and digital integration. For example, the AI platform City Brain by Alibaba Cloud aims to realize truly smart

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cities, a daunting task but not unachievable if efficiently fed with public state-provided data and complemented with further data sourced from, for example, Apollo by Baidu for autonomous driving, or Tencent's AI platform for a smart public health system coupled with aforementioned Ping An Financial's Ping An Good Doctor healthcare network (Ping An Healthcare And Technology Company, 2019; Varadharajan, 2017). The latter has also reached out, providing Ping An medical services in overseas markets, namely the U.S., Singapore, and South Korea. Thus, the country has established itself with domestic brands and tech giants beyond manufacturing that continue to stretch out and monetize on AI applications internationally, such as aforementioned Ping An, but also financial services. For instance, in East Asia, AntFinancial invested US$1.2 billion in South Korea's most important mobile payment app called KakaoPay and in South East Asia, the first data-related buy-in by a Chinese firm was a US$1 billion investment by Alibaba in Southeast Asia's e-commerce and shopping platform Lazada that operates in six countries across the region (Russell, 2017a). Additionally, China's Tencent and Alibaba strategically invested in and acquired complementary e-payment ventures in Thailand, Indonesia, Singapore, and the Philippines, amongst others (Ferenzy, 2018; Lee, 2018). By investing, acquiring and, thus, placing itself at the top of Southeast Asia's nascent startup ecosystem, China will most certainly play an influential and decisive role with the potential to develop and forge intra-Asian standards in data-based businesses. An argument can be made that this may particularly true for Southeast Asia as ASEAN-led and China-inclusive RCEP reflects Southeast Asian aspiration for economic integration with China, especially with regard to trade and data policies fit to emerging market conditions in ASEAN as opposed to imposed provision by industrialized economies of Asia or the West (Froese, 2018).

Although ethical norms are discussed and considered, a regulatory framework is to embedded into the law only between 2020 and 2030 (Ding, 2018). This enables political and corporate stakeholders to experiment with unfettered ways to extract and analyze data from the vast population and come up with unprecedented forms of applications. For instance, the social credit system that is planned to be implemented from 2020 is more of a tool for the communist party to exercise social governance and prevent socio-political conflicts rather than an economic innovation of data-fueled applications for economic purposes as seen by most liberal economies (Ferenzy,

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2018).[10] On the one hand, it certainly is an innovative application that may bring social benefits to the broader population if the Chinese socialist perspective deems people's upheaval and free opinion as interfering with the greater good of the country. On the other hand, ethical issues are increasingly gaining attention as 'morality' is a rather vague and certainly no ideological term that its definitional variety should not be forced upon the population through a public ranking system with benefits and punishments depending on ideological benchmarks. Despite a culturally distinguished definition of Chinese from Western morals, the Chinese government acknowledges common-sense principles to be part of the developing process of algorithms and data-applications that are supposed to translate into people's everyday lives for the sake of the social fabric, people's welfare, and their economic viability (Knight, 2019; Shafto, 2016; Shin, 2019).

Ding (2018) demystifies views on China through the Eurocentric or Western lens through which China is often depicted as the loner that does not want to integrate in a global (Western) world order in that there was little to no discussion of issues of AI ethics and data safety in China due to an exploitative government neglecting its citizen's rights. However, there is a debate on safety and ethical norms regarding AI, however, Ding (2018) adds that the Chinese approach to AI regulations and economic exploitation would certainly display ideological features that distinguish from juridical frameworks set out by the U.S. or by Europe's GDPR reflecting historically-derived different values (Webster et al., 2017). In 2019, the World Economic Forum articulated its own AI principles in collaboration with scholars, business leaders, and policymakers from the U.S., China, and others, with Lee (2018) as prominent AI investor and researcher who was involved in establishing Microsoft's and Google's outposts in China. He deems Chinese AI norms very similar to Western ones. For instance, the MOST-affiliated Beijing Academy of Artificial Intelligence articulated the *Beijing AI Principles* in the beginning of 2019, setting out norms for scholarship and AI development, including the need for "human privacy, dignity,

[10] The social credit system is designed to rate and rank the financial and social behavior of each citizen and legal person (which includes every company or other entity) in China, impacting access to not just credit but a broad ecosystem of punishments and rewards, including travel permission, domestic and international plane tickets, blacklists for employment at state-owned enterprises, rankings on dating apps, and discounts on utility bills (Ferenzy, 2018; Mahrenbach, Mayer, & Pfeffer, 2018; Yee, 2017).

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freedom, autonomy, and rights" (Knight, 2019). This is in line with the assumption that China is interested in international commercialization facilitated by complying with the global common sense based ethical dimension of data-derived applications.

3.4 South Korea

3.4.1 Conditions for data-derived value

Korea holds a strong position in the global semiconductor industry with a diversified manufacturing base. In 2018, Samsung overtook U.S. chipmaker Intel in total global revenue and henceforth led global sales in semiconductors with US$52 billion revenue in 2019 and, on the purchasing side, a more than two-fold increase, all of which depicts the dynamic development of the domestic tech sector (Holst, 2020). Korea was also identified by the Center for a New American Security as a prime strategic partner for mutually beneficial cooperation regarding semiconductor manufacturing, AI hardware, and research collaboration. As of 2019, Korea hosts 8 out of the 500 most powerful supercomputers in the world, with supercomputer Nurion ranking 14th (Strohmaier et al., 2019).

The general characteristics of South Korea's industrial structure can be largely traced back to Korean business conglomerates called chaebols which have been exercising a corporate influence on governmental policymaking since becoming the dominant force in South Korea's economy in the 1960s and 1970s (Kalinowski, 2009). Their traditionally good relationships with the government and banking sector as well as the high functionality of their corporate structures provided the chaebols competitive advantages on the way to the center of the world economy, a way that was marked by the small capacity of their internal market and predestined for export-led growth strategies (Pohlmann, 2005). Although the South Korean government has been trying to reduce the influence of the chaebols since the 1997 Asian crisis, they remain a determining factor in the South Korean political economy that can be considered a function of path-dependent forces. Their intertwining with policymaking may be conducive to establishing an innovation-driven digital economy as knowledge and know-how of experts from the private sector provide valuable input on how to best leverage data for corporate purposes. However, the chaebol system is prone to corruption and collusion that contrarily has the potential to impede innovation by eliminating true competition, as well as hampering the social agenda of South Korea

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if vested corporate interest is prioritized over social issues. As a potential countermeasure, the Presidential Committee on the Fourth Industrial Revolution (PCFIR), as discussed below, is a heterogeneous committee of public and private stakeholders to deliberate on 4.0-related issued from multiple perspectives (PCFIR, 2020). As for data-related technologies, the chaebol structure may have a significant advantage, nonetheless. Since chaebol operations are characterized by fast decision-making and the ability to change and adapt faster than other bureaucratic large corporations (Pohlmann, 2005), it is not only easier for conglomerates to gather and merge data from a broad spectrum of their respective portfolios, they may also be efficient in steering the formation of technocratic ecosystems according to identified application fields and further develop those into a comparative advantage among global digital production networks. Considering the socio-economic transition to and uncertainty of the digital economy, path-dependence comes into play in that social insecurity through "volatile destructive neoliberalism" impacting the country's "developmental liberal order" (Chang, 2019) and susceptibility to political promises of economic miracles have led the South Korean people and economic stakeholders to rely on a developmental state perspective and growth-oriented solutions through conglomerates that historically have showcased their capability to do so, thus, fostered their position in the public psyche to generate wealth (Kalinowski, 2009; Kang, 2003). Kang (2003) denotes the relationship between the private chaebols and the government's public stakeholder role as a reciprocal mechanism that has prevented to give excessive power to either the public or private sector and, thus, kept corruption from growing beyond control, calling this a 'mutual hostage situation' giving rise to peculiar South Korean institutional complementarities comparable to a system of checks and balances.[11]

As for big data technologies, the private sector plays a major role in investments, with about three quarters coming from large enterprises and the chaebols like Samsung and LG (Chang, 2019). Therefore, market-oriented R&D and solution-

[11] Kang (2003) puts forth the idea that if bribes were to be equated with a transfer of wealth from corporate chaebols to the political realm resulting in productive investments, this could actually lead to overall gains for the economy and society in overcoming pressing societal issues. Throughout the democratic transition, this "mutual hostage situation" had nurtured favorable conditions for a sociopolitical fabric with, for example, a social security network and labor unions, now at stake through destructive neoliberal forces since the Asian financial crisis (Chang, 2019).

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oriented application feasibility are at the core of technology investments. State proximity comes in handy because favorable conditions are created for these large conglomerates to pursue and integrate basic research on AI as discussed in the next section on institutional frameworks. Support comes in form of public investments to strengthen basic research, education, and open-access databases for public use and AI development, all of which aims to nurture the talent pool that thereupon, however, is most likely to be absorbed by the conglomerates with the financial capacity to buy experts for their own R&D purposes in corporate research facilities such as the Samsung AI Center, LG AI Lab, or Hyundai Motors AI established between 2016 and 2017 (Kim, 2019).

3.4.2 Institutional framework

In the wake of the 2017 impeachment of former president Park Geun-hye, current president Moon Jae-in pledges a more liberal course and declared Korea's "potential to emerge as an AI powerhouse … [as] the government's duty to turn that potential into reality" (Moon, 2020). He set up the Presidential Committee on the Fourth Industrial Revolution (PCFIR), with the chair held by former startup entrepreneur and investor Chang Byung-gyu, and a committee composed of 24 representatives from various ministries[12], academics[13], and private sector practitioners[14]. The multi-layered composition of the committee can be considered a first guarantor for holistic perspective-taking as opposed to policy approaches singularly serving corporate chaebol interest in the face of the socio-economic transition toward the digital economy. With input from the private and public sector, the Ministry of Science and ICT (MSIT) finds key tasks regarding 4.0 areas to be analyzed thoroughly by the ministries and two sub-committees, respectively: the special sub-committee for issues regarding smart city infrastructure or healthcare, and the innovation sub-committee with the three fields of expertise in science and technology, industry and economy, and the social system; the sub-committees report back to the ministry representatives,

[12] E.g. Ministry of Science and ICT, Ministry of Trade, Industry and Energy, Ministry of Employment and Labor, Ministry of SMEs and Startups, Ministry of Land, Infrastructure and Transport (PCFIR, 2020)

[13] E.g. Department of Biomedical Systems Informatics at Yonsei University, CK SMART Aged friendly Service at Hallym University (PCFIR, 2020)

[14] E.g. Korea Mobile Internet, Hyundai Motor Company, Korea Startup Forum (PCFIR, 2020)

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share policy directions and modify innovation policies to be carried out by the ministries (PCFIR, 2020). Key fields proposed to the innovation sub-committee include not only further developing ICT networks for data flows but also the "strengthening of data production and utilization technologies" to provide for "ecosystems for innovative tech startups … and developing new services" (PCFIR, 2020). These are identified as a key contribution to *The People-Centered Response Plan* released by the PCFIR that can be integrated within the smart city and healthcare vision to alleviate chronic social problems by putting forth intelligent technologies to prepare the workforce for change and create high-quality jobs based around emerging industries that "secure data and networks accessible to all" (PCFIR, 2020).

The MSIT set out the I-Korea 4.0 roadmap to define industries and sectors that the government targets with their *innovation growth engine policy* (MSIT, 2018) including measures promoting smart factories at the manufacturing base, digital growth incubators and emerging fields for economic diversity, and enhanced support strategies for a knowledge-based digital economy to transform Korea incrementally with targets set for 2023 and 2030. The blueprint lays out a holistic approach to transforming, merging, and connecting various socio-economic domains of the digital economy. As for artificial intelligence, the MSIT (2018, pp. 3-4) classified these domains and highlighted artificial intelligence as a core technology to be developed in each single one: a) the industrial base, for example, acquiring core technologies for AI semiconductor devices (intelligent semiconductors) with a global market share of 7 percent by 2022; b) the intelligent infrastructure with a large high-quality data pool for open data utilization, analysis, and prediction, as well as kick-starting companies specialized in AI and boost their number from 34 as of 2017 to 100 by 2022 in order to disseminate AI and secure proprietary algorithm-based technologies of the future; c) smart moving objects relying on the industrial base for production and the intelligent infrastructure for application, including drones and autonomous vehicles; and d) convergence services relying on big data such as smart city solutions and medical healthcare safety-robots, and virtual / augmented reality platforms and devices to induce industry fusion, namely education and manufacturing. The *innovation growth engine policy* (MSIT, 2018) shows governmental efforts in leveraging Korea's comparative advantages such as innovating on the strong manufacturing base by transforming it into the smart supplier of hardware needed for effectively applying data-based core technologies in tandem with creating competitive

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ecosystems and jobs for innovative thinking and entrepreneurial spirit outside the chaebol network. For instance, one of the objectives in the domain of convergence services is to foster and establish more than 100 enterprises with $US10 million sales revenue in the fusion field of virtual and augmented reality by 2022 in order to diversify the development potential outside of the leading companies Samsung and LG Electronics (MSIT, 2018, p. 4). For AI development specifically and its commercialization, a public-private joint project, the *AI Hub program* as elaborated in the following section, was established in 2019.

3.4.3 Regulation and commercialization

The holistic development approach, similar to Japan, not only considers the revitalization of Korea's strength in manufacturing but first and foremost its reconfiguration through industrial AI utilization for adding value in manufacturing by exploiting advanced ICT. With the government strengthening and steering through industrial incentives towards convergence of AI and algorithm-based hardware and software, South Korean corporations are holding strong positions in global value chains and have great potential to monetize upon digital technologies. Despite the structural dominance of conglomerates, competition exists among the big players as stipulated by the law, incorporating suppliers along the value chain, and driving product innovation coupled with IoT applications: smart speakers were first launched by SK Telecom in 2016, followed by devices by South Korea's largest online platforms Naver and market-listed Kakao in 2017 (Won & Hye, 2019). As internet-based platforms connecting a variety of services such as search engines, streaming and media outlets, and e-commerce portals, their access to data on the Korean market enables them to develop IoT applications of such kind and innovate upon demand. In 2020, Samsung Electronics will also introduce an advanced IoT smart speaker. In fact, the Samsung conglomerate plans on pushing the boundaries towards state-of-the-art consumer electronics with particular regard to smart home devices and connectivity. A visit to Samsung D'light, the company's exhibition center in Seoul, in 2019, provided me with an immersive experience of Samsung Electronics' ambitions to integrate IoT as the new digital utility in people's lives with AI at its core. Besides an exhibition on the new generation of semiconductors which the IoT is based on in its physical dimension, a showroom exhibiting existing and currently being planned

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and designed gadgets by the company for the smart home of the future: from smart beds that regulate room temperatures according to our body and behavioral data collected during our sleep, then transmitted to intelligent mirrors in the bathroom that scan our skin condition and process all the gathered data to give suggestions on healthy habits and foods, with the latter being stored in Samsung's smart fridge with AI-powered food recognition, temperature control, supply notifications, and integrated purchase suggestions. The list is long but interestingly epitomizes the overall convergence of Korea's strength in hardware production and 4.0 ambitions in software development.

As for data-driven growth potential, President Moon sees creativity and the media industry as driving forces behind prospective growth and is eager for Korea "to stand tall as a media powerhouse in the global media market that is seeing seismic changes" (Moon, 2020). For example, the government invested in and nurtured the creative industry over years and promoted the emergence of an entirely new genre of Korean pop-music to an extent that gave rise to a new sector dedicated to digital content distribution that gave rise to new marketing strategies based on entertainment: In 2018, South Korea had the fifth-largest sales of digital media in the world and the sector continues to grow and gain popularity abroad (Holroyd, 2019, p. 13). For instance, the Korean boyband BTS was the first Korean music group to enter the U.S. album charts at number one with a foreign-language music album on the English-dominated U.S. market, gaining acknowledgment by President Moon (Chiu, 2018). Domestically, the Korean entertainment industry blends in with formerly separated sectors such as the financial sector and finds its place in the 2st-century fintech sector (financial technology): through data-enabled targeted marketing, domestic online platforms such as aforementioned Naver and Kakao are better able to track users' behavior and aspirations through their extended network and access to user data. Kakao, for example, combines services such as ride-hailing and shopping outlets and has launched the first Korean digital-only bank Kakao Bank (Wilson, 2018), with a digital payment wallet system for convenience that allows the provider to place targeted loan and credit options with the user's favorite Korean pop-music group or entertainer, making the product more interesting through customized advertising. To develop new business models and forge innovative digital ecosystems around media, Seoul's newly erected Digital Media City, Korea's first creative cluster, houses broadcasting channels and was set up to connect small businesses with big players

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through subsidizes office rooms, tax breaks, etc. (Cohen, 2013). The Digital Media City is an entirely new city district with attractive housing and leisure options strategically located between the city center and the industrial cluster around Incheon airport. Such creative hubs have become a target point in creative policy formulation with regard to open up new channels of enhancement for the digital economy and explore new areas for growth with particular regard to AI-based applications as outlined in the *innovation growth engine policy* (MSIT, 2018) under I-Korea 4.0.

Within the framework of I-Korea 4.0 and emphasis on enhancing the "DNA industry" (data, networks and AI) as put by president Moon (2020), the *AI Hub program* was jointly launched by the MSIT, the National Information Society Agency, the National IT Industry Promotion Agency, and the Electronics and Telecommunications Research Institute in order to advance the nation's competitiveness in AI and other algorithm-based technologies. AI Hub is an online platform providing AI infrastructures[15] for businesses, students, researchers, and developers that integrates public and private data and open-sources it for everyone to use in an attempt to spark innovative and smart service models for successful commercialization (AI Hub, 2019). Data as an open resource provides high quality AI learning datasets that would otherwise be difficult for small and medium companies, research institutes, and individuals to obtain by themselves due to high cost and input time. Overall, this approach strikes a balance between providing fundamental researchers with the resource needed at low cost and the market-oriented R&D ambitions of corporate ventures in that the program allows everyone to use it for research or monetizing on public-private data, respectively. However, it pertains to core objectives in two domains of the I-Korea 4.0 roadmap regarding leveraging AI with particular regard to its commercialization potential (MSIT, 2018): establishing the intelligent infrastructure with high-quality databases for open data utilization, analysis, and prediction, as well as kick-starting companies specialized in AI and boost their number from 34 as of 2017 to 100 by 2022 in order to disseminate AI and secure proprietary algorithm-based technologies of the future; and establishing convergence services relying on big data such as smart city solutions and medical healthcare. For instance, to work towards the (MSIT, 2018) objective of developing thirty medical devices with export potential and twelve with export sales exceeding

[15] infrastructure services include AI data, AI software, AI computing, AI Easy Builder (AI Hub, 2019)

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US$100 million, AI Hub (2019) was provided with medical images for further dissemination, including disease diagnosis image AI data such as 30,000 mammography images and 4,500 fundus images for eye disease detection (AI Hub, 2019). There is a need to build an efficient and systematic medical knowledge base not only to activate AI startups for the medical industry but also to advance these technologies for the sake of finding solutions to pressing issues, such as an aging society. Other data include published CCTV data showing anomalies in people's behavior, such as assaults, fighting, theft, vandalism, fainting, or intoxication. The AI Hub program is relatively new, at the time of writing this thesis, was announced to be complemented with 60 million new data items in 2020 (Yonhap, 2019). However, these data are sensitive in that medical conditions and individuals' behavior are captured and exposed on the internet. This impediment was addressed by the ministry, saying that in Korea, it is still difficult to open and use high-quality data due to various issues such as personal information infringement, copyright, and portrait rights. Thus, there is a need for strategies to ensure corporate utilization of de-identified information while safeguarding privacy.

Data privacy has in fact been addressed through the Personal Information Protection Act (PIPA) by the Ministry of Interior and Safety (MOIS). In fact, Korean regulations are very much on par with GDPR provision, mostly addressing the anonymization of personal data as well as data subjects' rights requiring consent to collect, process, retain information for corporate utilization (Kang & Lee, 2019; Simmons, 2019). The equalization of personal data protection laws with EU regulations bears many advantages for future trade and corporate investments between digital economies pledging data protection. Through the anonymization of personal data, that is data that cannot be used to identify an entity, their legitimate distribution enables businesses to leverage these with regard to developing competitive big data applications in a multinational context. For instance, the PIPA states various rights of persons, called data subjects, such as:

> "the right to be informed of the processing of such personal information … the right to confirm the processing of such personal information, and to request access (including the provision of copies …) to such personal information … the right to suspend the processing of … and destruction of such personal information" (MOIS, 2016, article 4-1, 4-3, 4-4)

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These provisions comply with European GDPR regulations, particularly with data subjects' right to give consent for data handling as well as their 'right to be forgotten' through suspension and deletion of personal unless retention is justified. Such personal information, for instance, includes spatial information for advanced real-time tracking with widespread 5G networks. The *Act on the Protection, Use, etc. of Location Information* (Korea Communications Commission, 2016) incorporated PIPA provisions in that "location-based service provider[s] … shall specify, in advance, the following in its terms and conditions and obtain consent from the subjects of personal location information" (article 19-1) and granting data subject rights and requesting providers' compliance to "request, at any time, a location information provider, etc. to temporarily suspend the collection, use, or provision … the location information provider, etc. shall not refuse such request and shall take technical measures accordingly" (article 24-2). To further develop regulations in place regarding the digital society, the Basic Act on Intelligent Information Society was introduced and has been under revision since 2017 (Won & Hye, 2019). The act suggests supplementary regulatory frameworks for a socioeconomically sustainable digital future and can be considered an attempt to further synchronize domestic compliance with and formation of international standards.

As for Korean copyright, the Ministry of Culture, Sports and Tourism (MCST) is the governmental body in charge of formulating and enforcing copyright stipulations. Currently, the copyright in Korea protects works which are creative productions expressing "human thoughts and emotions" (MCST, 2017, article 2-1), thus, AI-derived creations would not fall under the protection of the copyright; however, a 'big data' dataset falls under the protection of the copyright act because it represents a compilation of selected data that has been arranged systematically or in creative ways, which in turn could be done by human hypothetically with the help of machine learning and algorithms (Won & Hye, 2019). The distinction in the Korean copyright is not yet clear and is set to be amended in 2020.

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3.5 Focus Southeast Asia: The ASEAN region

3.5.1 Conditions for data-derived value

The fourth industrial revolution hits the world in an unprecedentedly globalized state with big data as a new resource. This new resource presents itself with transaction costs close to zero in terms of technology diffusion, data can be scraped and mined through the internet in unthinkable amounts. Thus, data gives scope to great potential to be leveraged by economies worldwide regardless of their development. As a booming region of "the Asian century" (Khanna, 2019), the Asia-Pacific showcased special trajectories of economic development in its past with an impressive catch-up process of the newly industrializing economies (coined as the flying geese paradigm), giving rise to the question as to whether presently emerging Southeast Asian economies of the ASEAN can leverage data-driven off-the-shelf technologies with transactions costs close to zero to further expedite their catch up process and eventually shift toward a new kind of development process beyond the flying geese paradigm. The catch up has mainly been characterized by countries that were able to take advantage of globalization and fragmentation of international production (Haraguchi et al., 2019).

The more conservative and inefficient an industry is, the greater are the potential benefits from newly applied information technology to boost productivity growth. Beyond the well-known cases of China and Vietnam, it is worth showing that also smaller countries such as Cambodia, Laos, and Myanmar have taken advantage from their proximity to the regional production hub that has established in Asia, consequently playing an important role in regional production networks and in the expansion of intraregional trade benefiting from the fact that larger Asian economies are currently upgrading within the value chain while offshoring some of the labor-intensive phases of production (Asian Development Bank Institute, 2014). According to the Initiative for ASEAN Integration launched in 2000, the beneficiaries CLMV for the sake of their development and integration into ASEAN (ASEAN, 2015, 2016). Despite their status of less developed emerging economies, Vietnam, Indonesia, Myanmar, Cambodia, Lao are becoming an integral part of regional production networks, namely through import-export of machinery components (Harvie & Charoenrat, 2015). Due to cost-reducing ICT, these emerging economies in with manufacturing at the core of their catch-up experience are thriving and record big

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gains at a faster pace than ever in their national development (Asian Development Bank Institute, 2014; Chitturu et al., 2017). However, there are only a few companies in the region that successfully integrated AI into their business model, which can be traced back to hurdles such as the lack of an indigenous talent pool and the data resources needed to develop and deploy algorithms at scale, let alone the lack of a sufficient digital infrastructure which by implication restricts access to high-quality data in the first place – all of which makes it hard for stakeholders to coordinate and develop long-term business perspectives that allow for monetizing on datafication and data-related business models (Microsoft Asia News Center, 2020; Trueman & Lago, 2020).

3.5.2 Institutional framework

3.5.2.1 The e-ASEAN program

ASEAN acts as a political and economic interest group that makes decisions by consensus with the greater goal of forging a single market –the ASEAN Free Trade Area (AFTA)– for the free flow of goods and services through agreements such as the ASEAN Framework Agreement on Services (AFAS). Due to their 'latecomer status', their common objectives are based on a strong regional identity to jointly integrate in a global economy through improving their presence in the world market by lowering customs barriers such as tariffs reduction to five percent among participants whilst increasing the ASEAN market's attractiveness for foreign investors (Chen & Lombaerde, 2019; Langdon & Job, 1997). The e-ASEAN task force puts forth that the usage of ICT enables participation in globalization processes and participation in globalization processes, therefore, enables socioeconomic development (Ochs, 2013). Thus, the e-ASEAN program was launched on a ministerial level with the first ASEAN Telecommunications Ministers Meeting (TELMIN) in 2001, and implementation redirected to senior official level and affiliated working groups under the auspices of the Telecommunications and Information Technology Senior Officials Meeting (TELSOM) in order to address the joint objectives outlined in the e-ASEAN Framework Agreement:

> "… to (a) develop, strengthen and enhance the competitiveness of the ICT sector, (b) reduce the digital divide within and amongst ASEAN Member Countries, (c) promote cooperation between the public and private sectors, and (d) develop an ASEAN Information Infrastructure." (ASEAN, 2012)

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Further steps were taken in an attempt to close the digital divide between ASEAN members at the 2011 TELMIN. The adoption of the *ASEAN ICT Masterplan 2015* (AIM2015) specifically points to the importance of enhancing ICT development for further regional integration and cooperation. Projects and timelines were set up to coordinate member states policy directions regarding ICT, with key thrusts to reach sustainable outcomes: "ICT as an engine of growth for ASEAN countries, recognition for ASEAN as a global ICT hub, enhanced quality of life for the peoples of ASEAN, contribution towards ASEAN integration" (ASEAN, 2012). To monitor and evaluate project outcomes, telecommunication ministers tasked TELSOM to scrutinize progress throughout the masterplan's implementation for people-centered and inclusive achievements. Given member state's varying economic development and the consensus-based ASEAN foundation without an enforcing body, these directions are generally vague. The masterplan's final report at the 2015 TELMIN noted these shortcomings and gave suggestions for a revised framework of the follow-up ASEAN ICT Masterplan 2020 (AIM 2020). Suggestions include:

> "… to define clear, specific and measurable goals to better assess the level of achievement of the implementation activities; to improve the resource planning in order to allocate appropriate resources to each of the initiatives; to identify more activities on human capacity development to narrow the development gaps amongst [ASEAN member states]." (ASEAN, 2015)

Human capacity development was identified as an important economic driver for inclusive development and innovation. Considering the recommendations set out in the AIM2015, the AIM2020 first touched upon the transformative potential of a "digitally-enabled economy" within the ASEAN Community. The strategic thrusts target an inclusive economic ASEAN ecosystem enhancing "people integration and empowerment through ICT, … and human resource development" as well as "ICT in the ASEAN Single Market, … New Media and Content, … Information Security and Assurance" (ASEAN, 2015). To achieve better results, TELMIN advocates for collaborative activities with the ASEAN Dialogue Partners China, Japan, South Korea, India, the U.S., and the EU (ASEAN, 2012), but stresses that mutual commitment among member states is key to the formation of a trues e-ASEAN community, with particular regard to addressing local issues. Therefore, Singapore plays an important role in terms of capacity building, as discussed in the next section (3.5.5.2).

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Surprisingly, none of the documents and ICT-related policy frameworks and guidelines touches upon artificial intelligence technologies specifically. However, to jointly create a digital-friendly intra-ASEAN policy environment, the ASEAN Economic Ministers (AEM) Meeting in September 2019 concluded with the adoption of the *ASEAN Digital Integration Framework Action Plan 2019-2025* (AEM, 2019) to propel policy streamlining and transparency of domestic laws with particular regard to intellectual property rights and "conducive environment[s] to foster the growth of e-Marketplace and eCommerce platforms" (p. 5). TELSOM is in charge of monitoring and updating the timelines for this ongoing endeavor. For instance, the action plan aims to come up with an ASEAN data classification scheme to categorize cross-border flowing data depending on their sensitivity so that ASEAN member states are provided with clear classifications to adapt and model their legal system. So far, the designated workgroups conduct "voluntary internal and peer reviews of national laws/regulations on e-commerce" (AEM, 2019, p. 7) in order to effectively implement, for instance, the ASEAN Payments Policy Framework for Cross-Border Real-Time Retail Payments by 2020, upon which interoperable electronic payment systems and corresponding legal conditions are to be realized by 2021 (AEM, 2019, p. 16). To facilitate emerging platform systems as well as foster existing booming ones such as aforementioned online retail platform Lazada or multi-service application Gojek, improved regulations and coordination mechanisms are planned to be implemented by 2021 for the sake of digital accountability and liability in the ASEAN area. According to the *ASEAN Digital Integration Framework Action Plan 2019-2025* (AEM, 2019), this is key for inclusive and competitive physical as well as digital supply chains, particularly for integrating small and medium-sized ASEAN enterprises in order to participate at a low-cost. Thus, ICT infrastructure enhancement is to be improved for overall ASEAN peoples' socioeconomic participation, as well as enhancing and fostering existing platforms for peoples' integration to form an ASEAN "Digital Service Hub" by 2025 (AEM, 2019, p. 25). Moreover, this emphasizes the people-centered (ICT) development approach for the action plan intersects with the *ASEAN Strategic Action Plan for SME Development 2016-2025*.

3.5.2.2 Role of Singapore in e-ASEAN

As the leading economy among ASEAN countries in terms of GDP per capita and general wealth of the society, Singapore is actively offering to share its best practices

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with its neighbors. For instance, the Singapore Cooperation Program (SCP) is a governmental series of technical assistance and skill development projects to bring together mid- to senior-level government representatives to provide a platform for knowledge-sharing on Singapore's best practices in policymaking (SCP, 2019). Through workshops, lectures, and discussion rounds, participants are gaining input to develop skills and the ability to address challenges posed by current global economics, and formulate and implement adequate reforms fit for their home countries to efficiently leverage and integrate available technologies in their native institutions. According to the Initiative for ASEAN Integration (IAI) launched in 2000, the beneficiaries of these particular assistance programs are the new CLMV member countries for the sake of their development and integration into ASEAN (ASEAN, 2016). In the face of the digital economy, the SCP offers recurring courses within the scope of its 'enabling actions' track such as "Developing Digital Government Strategies" or "Industrial Revolution 4.0 and Its Impact on Policy Formulation" (ASEAN, 2017; SCP, 2019). The latter, for example, emphasizes:

> "… the impact of technology developments and the digital economy on work, manufacturing, the labour market and security … to equip participants with the knowledge, skills and ability to plan, formulate and implement appropriate and good institutional and policy reforms and strategies to meet the challenges brought about by developments in technology." (ASEAN, 2017)

Thus, the strength of SCP projects may lie in the fact that human resources are Singapore's most valuable driver of growth and value-added, which provides the smaller CLMV nations with extraordinarily well-developed knowledge and skills in managing people-centered approaches to wealth and labor allocation.

3.5.3 Regulation and commercialization

There are no unifying regulations regarding data protection across ASEAN countries and provisions differ territorially with Vietnam and Malaysia exempting public sectors and the Philippines setting out different data-treatment regulations depending on citizenship (Rooney, 2018). However, rather than through a sociopolitical impetus, economic cooperation is the main driving force to put forward assimilation of data privacy frameworks, for instance, through the Cross-Border Rules System set in place by the Asia-Pacific Economic Cooperation (APEC), requiring business activities to comply with the *APEC Privacy Framework* (2017). The framework provides member

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states with basic guiding principles of privacy protection to ensure a certain extent of synchronized information laws to avoid trade disruption through cross-border information flows. These principles have been incorporated in most jurisdictions in the region, namely Japan, South Korea, Singapore, and China, as discussed in the respective chapters. ASEAN states, such as Indonesia, the Philippines, Vietnam, and Malaysia have also implemented information protection regulations pertaining to the APEC guiding principles; however, these principles are vaguely formulated and mainly highlight the importance of business facilitating mechanisms to maintain the cross-border flow of information while protecting individual's rights. This points toward the negative regional economic integration model regarding business-driven data policy formulation to remove trade barriers. This is reinforced by the fact that the APEC Privacy guidelines consist of principles rather than stipulations, giving enough leeway to APEC members for adequate policymaking according to their needs and economic stage of development. This leeway can be deemed conducive to creating a data-sensitive but also a bigtech-embracing environment of digital ecosystems in ASEAN, APEC, and the Asia-Pacific, considering that members include advanced economies such as the U.S., Canada, and Australia, and other less developed and emerging economies in Southeast Asia such as Vietnam or Indonesia:

> "The Framework specifically addresses the importance of protecting privacy while maintaining information flows, as well as issues of particular relevance to APEC member economies. Its practical and distinctive approach is to focus attention on consistent rather than identical privacy protection. In so doing, it seeks to reconcile privacy with business and societal needs and commercial interests, and at the same time, accords due recognition to cultural and other diversities that exist within member economies." (APEC, 2017, pp. 3-4)

Streamlining individual member states' privacy laws towards consistency aims at establishing consumer and corporate trust in cross-border flows of personal information (Rooney, 2018). As for ASEAN states Cambodia, Lao, and Myanmar, who are not members of APEC, it can be conjectured that their commitment to formulating information privacy policies in the future will be largely influenced and provided by those partners whose preferential treatment they enjoy and regional production networks they are involved in, as well as establishing trustworthy policy frameworks to attract investors and guarantee compliance and stability. Considering the expansion of intraregional trade benefiting from the fact that larger and more mature Asian economies such as China, Japan, and Korea, are upgrading within the

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value chain while offshoring some of the labor-intensive phases of production to ASEAN APEC- and non-APEC member countries (Asian Development Bank Institute, 2014), emerging ASEAN economies in particular are prone to aligning with internationally data protection norms. Against the background of the trade and business-driven approach, the political perspective and conjecture that ideological particularities of countries in the region, such as a hypothetic communist block within APEC made of China and Vietnam with adverse positions towards the rest, can be discarded. Thus, the negative regional economic integration assumption regarding data protection policy holds.

Whilst catching up to more advanced manufacturing processes and automating core business processes, cost-efficient off-the-shelf AI and IIoT technologies may boost productivity and grow income levels in ASEAN's low-income/emerging economies and release labor into the tertiary sector to an extent that has the potential to shift the paradigm from traditional catching-up trajectories of their predecessors in Asia-Pacific (the NIEs) towards premature deindustrialization as pointed out by Rodrik (2015). However, ASEAN countries have so far been thriving and record big gains at a faster pace than ever in their national development (Asian Development Bank Institute, 2014; Chitturu et al., 2017), and relatively few have implemented AI in their core business operations (Trueman & Lago, 2020). On the one hand, this may speak against disruptive premature deindustrialization due to AI and, thus, speak for balanced development and upgrading trajectories in tandem with the incremental creation of homegrown digital ecosystems. On the other hand, this may reflect the general lack of infrastructure and stakeholder coordination necessary to give scope to nascent digital ecosystems, bundled with the lack of an indigenous AI talent pool and forfeited chances to develop the human resources needed.

However, hurdles remain on the way towards regional digital/economic integration. The ASEAN Coordinating Committee on Electronic Commerce (ACCEC) introduced the Guideline on Accountabilities and Responsibilities of E-Marketplace Providers (ACCEC, 2019) not until very recently at the time of writing this thesis. The document lays out the very simple principles for platform providers to require businesses operating through them, such as 'honest advertising', as well as notifying "customers of the purpose(s) of the collection, use or disclosure of personal data" (ACCEC, 2019, p. 2). These data collection disclosure requirements, as well as

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additional intellectual property guidelines, pertain in large parts to GDPR provisions, not least because the ASEAN Digital Integration Framework Action Plan 2019-2025 was informed by “enforcement practices in EU” (AEM, 2019, p. 6). While these guidelines surely aim to establish a trust-building digital infrastructure, the GDPR-like complexity could pose new entry barriers such as high compliance costs, especially concerning the integration of smaller enterprises –in less developed digital environments such as remote areas of CLMV– and, therefore, counteract efforts in reducing the digital divide.

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Chapter 4. E-commerce industry case study: Alibaba Group

4.1 E-commerce and regional connectivity

The platform economy and society reconfigure the way that people and businesses connect, share information, consume services, and conduct commerce (Dijck, Poell, & de Waal, 2018). Online platforms of any kind are interconnected through the overarching and global digital infrastructure and 'utility' of the internet, and allow interactions between multiple online and offline users (Keane & Yu, 2018). The most widely used platforms include search engines, media platforms, and social network platforms with user data exploitable for new B2C business models such as cost-effective targeted marketing and redirection to external digital services as discussed before in the case of Korea.[16] But also B2B and C2C interactions have become smoother through online interactions and reduced transactions costs. Therefore, e-commerce platforms can be considered intermediaries that connect and bring together different users such as "customers, advertisers, service providers, producers, suppliers, … physical objects" (Srnicek, 2016, p. 605), linking the offline businesses to consumers online. These actors gather on online marketplace where supply and demand conveniently meet for customer's comparing offers and businesses' positioning among competitors.

Connectivity is the cornerstone of e-commerce, facilitating a network. It consists of "the smooth exchange of data and information … , the delivery of goods and services (logistics), … cash flow, and the seamless links between the virtual and physical part of e-commerce network" (Chen, 2017, p. 15). In general, the urban-rural and digital divide in emerging Asian economies face challenges from ICT and infrastructure development gaps existing across the Asia Pacific region. This is where Chinese companies can play a pivotal and supporting role in digital regional integration because China's digital revolution and fast-paced "platform infrastructuralization" experience domestically has enabled its native tech giants not only to build a massive ecosystem of platforms in China but also overseas with particular regard to the Asia Pacific, challenging dominant U.S.-based digital

[16] Domestic online platforms Naver and Kakao track and merge data on users' online behavior such as following their favorite Korean entertainment stars etc., allowing providers to place targeted advertising more efficiently by making the product more interesting through personalization (Wilson, 2018).

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platforms such as Amazon and Facebook through sheer capacity and the geographical advantage (Plantin, Lagoze, Edwards, & Sandvig, 2016). This also generates opportunities for SMEs to join global value chains and benefit from globalization since in Asia, SMEs account for over 95% of all enterprises and employ more than 80% of the workforce (Chen, 2017, p. 24). Thus, development and expansion of e-commerce and related services can support regional economic integration and "facilitate SMEs' access to information, exploring new market, obtaining microfinance, and enhancing supplier–producer–consumer links" (ibid., p. 24). China has the largest e-commerce market in the world, including C2C, B2B, and B2C business models, which generates various opportunities for foreign businesses (Vila Seoane, 2019). The case of China's Alibaba network shall be used to illustrate the dynamics in cross-border trade in the Asia Pacific.

4.2 The case of Alibaba Group

Alibaba is already the leader in the Chinese e-commerce market in terms of sales, with the company's market share expected to be around 58 percent as opposed to U.S. competitor's Amazon's outlet Amazon China with an estimated market share of just 0.7 percent (Rabe, 2019). Active consumers on its online shopping properties reached 711 million by the end of 2019 (Blazyte, 2020). Alibaba's sales have grown steadily, reaching around RMB377 billion in its fiscal year 2019 by March, equivalent to approximately US$56 billion; compared to the previous year, sales increased by around 51 percent, with the largest share of sales from around RMB257.6 billion in Chinese domestic trade and RMB27.7 billion in international trade (Rabe, 2019). The share of mobile commerce, that is users purchasing on the platform via mobile devices such as phones, was already at 85 percent in 2017 with a market share of mobile advertisement at around 40 percent by 2018 (Rabe, 2019; Statista, 2020). Alibaba Group was founded in 1999 by Ma Yun, known as Jack Ma, a Chinese entrepreneur from Hangzhou who quickly grasped the international potential offered by the Internet and founded China's first Internet company, the yellow pages, which later gave Ma the idea of bringing the Chinese and foreigners together via the Internet (Clark, 2018; Lee & Song, 2016). When Alibaba entered the Chinese market at that time, the aim was to close the gap between small companies in their search for business contacts with foreign companies and suppliers (Yang, 2019). The core business of the group at that time consisted of an Internet contact exchange for

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companies. The buyers were able to use the contact exchange to find their suppliers and partners for their business. The group primarily addressed small and medium-sized companies that sought contact with Chinese partners via Alibaba. In addition, the contact exchange helped companies to bypass intermediaries and thus reduce transaction costs (Huang, Liu, & Yeung, 2017). Alibaba's expansion into a comprehensive e-commerce ecosystem progressed quickly: the financial resources required for the expansion initially came from the partner Yahoo. Additional capital was raised in 2007 by going public in Hong Kong, and by generating US$21.8 billion at the New York Stock Exchange as the largest American IPO in history (Yang, 2019; Yiu, 2019). As of 2014, the main shareholders are the Japanese telecommunications and media group SoftBank, Yahoo[17], Jack Ma and the management, and a third in free float (Yang, 2019). As a group of companies, the Alibaba Group owns other subsidiaries besides the largest core website Alibaba.com, including the platforms Taobao, TMall and AliExpress, which are briefly introduced below.

Alibaba Group became the leading company with various e-commerce services across its marketplace platforms Alibaba.com (B2B), Taobao (C2C), and Tmall (B2C). The ecosystem is completed by leading electronic payment service Alipfickpeteray, cloud computing services and other related services to meet all needs in e-commerce and create a comprehensive customer experience (Blazyte, 2020). Alibaba.com was the first website of the company and the largest B2B Internet portal in the world with Chinese as well as with foreign buyers (Huang et al., 2017; Vila Seoane, 2019). The web platform is a contact exchange, bringing importers and exporters together and, thus, facilitating trade between companies, half of which are from China and the rest from the U.S., Europe and India. Taobao is Alibaba's C2C online auction and e-commerce platform where individuals and small businesses can auction and sell goods to customers with the highest bid. Tmall is the first platform for online shopping of branded products and was launched by Taobao in 2010 to supplement Taobao's C2C ecosystem with B2C (Wei, Lin, & Zhang, 2019; Yang, 2019). This has the advantage that buyers can watch, search, and find their products and purchases on both TMall and Taobao, but customers of TMall benefit from additional extras such as better customer service, discounts, or vouchers, which was included initially as an enhanced customer experiences as outlined in the previous

[17] Yahoo's equity of Alibaba was repurchased by Alibaba at an extremely low price (Yang, 2019).

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chapter. Moreover, AliExpress is the leading B2C wholesale marketplace. The online shop was also founded in 2010 and is now a reliable source in the online shopping community, which offers high quality Chinese products at wholesale prices (Wei et al., 2019). AliExpress also offers buyer protection which ensures that the seller receives the purchase amount from the customer only when the ordered items have reached the customer – a crucial trust-enhancing feature that accounts for consumers' choice of a certain e-commerce platform (Srnicek, 2016).

4.3 Alibaba's domestic ecosystem

The success of Alibaba roots rather in entrepreneurial endeavors to deliver digital solutions than relying on protectionist state-intervention of the Chinese government as one would conjecture if the hypothesis of Asian data capitalism held true. Firstly, the connection of Taobao with Tmall supplements Taobao's C2C ecosystem with a B2C option (Wei et al., 2019; Yang, 2019) and expands the reach of SMEs and entrepreneurs across the country. An argument can be made that this is to be considered an alternative draft to Western ideas of entrepreneurial startup culture in the realm of e-commerce because economic agency and empowerment are directed at the market and people in remote areas to participate and reach out to customers with their businesses countrywide and globally. Alibaba's platform integration, thus, spreads economic empowerment and digital governance to the market at the private sector-level.

Secondly, the development of innovative e-commerce business models are driven by market-demand and not dictated through governmental investments in new business models. For instance, following the developments in consumer behavior in China, 80 percent of retail sales are still generated in brick-and-mortar retail, but at the same time e-commerce usage is highest in China worldwide (Li, 2019; Lu & Reardon, 2018). Retail will not be a question of online or offline, but the ideal link between them. With Hema, Alibaba has created a retail format to test and develop new ideas and bolster innovative online-offline e-commerce innovation, and no other company worldwide has managed to achieve this level of "barrier-free" consumption options(O'Dwyer, 2018). At its core, Hema combines online and offline purchase via smartphone in physical store by scanning articles' code to obtain more information about it, related product recommendations, and menu suggestions for groceries and foods that can be prepared by cooks at the store, taken home or delivered; the

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ecosystem is making extensive use of AI applications that integrate services facilitated by the ICT infrastructure, such as financial mobile provider Alipay for transactions and customized consumption recommendations, aforementioned Tmall for product localization and storage, bicycle sharing platform Ofo and navigation service Autonavi for timely delivery, and automatic initiation of restocking in Hema's supply chain management systems (Ito, 2019; Li, 2019; O'Dwyer, 2018). With its popularity and fast growth, the test phase has ended and the 'new retail market' is already available in Beijing, Guiyang, Hangzhou, Shanghai, Suzhou, Shenzhen and Ningbo, with 2,000 additional stores expected to open in the next five years.

Thirdly, Alibaba Group's e-commerce platforms outplayed foreign competitors through their domestic advantage in sociocultural access to the consumer market rather than through preferential treatment by the government. For instance, in contrast to the American auction platform Ebay, Taobao introduced an integrated chat room and video channel for buyers and sellers to create closeness and trust and impede and navigate buyer-seller matching through culture-specific interfaces for better access of local customers (Hong, Zhu, & Dong, 2020). Additionally, Alibaba monetized on specific sociocultural and –economic circumstances in China, such as 'single's day' which Chinese students started in the nineties to celebrate their solitude due to demographic conditions in the country; in 2009, Alibaba's Tmall offered special pricing and promotions on that day and Taobao and others quickly followed, with a billion orders being placed that day alone (Blazyte, 2019). Taobao increased its e-commerce market share from 8 to 59 percent within two years, displacing the U.S. auction giant Ebay from the Chinese market. Similarly, U.S. based e-commerce company Amazon shut down its marketplace in China with only 0.7 percent market share but remains through smaller units and prospects to partner up with cross-border e-business Kaola by NetEase with a 22.6 percent market share (Liao, 2018).

Altogether, two things can be recorded: a) the government does not forbid foreign e-commerce businesses to enter and compete on the domestic e-commerce market, and b) it has not the impetus to do so as cross-border e-commerce grows increasingly important as Chinese consumers become more affluent and long for quality goods from abroad (Blazyte, 2020; Chen, 2017; Sawada et al., 2018). An argument can be made again that the market governs the digital utility of e-commerce ecosystems and not the government through protectionist measures to create the

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ecosystem in the first place, contesting Asian data capitalism as an institutional approach from the e-commerce industry perspective.

4.4 Alibaba's regional ecosystem

For cross-border shopping has become an integral part of the ecosystem as Chinese consumers become wealthier, Alibaba has reached out transnationally to tackle overseas markets and establish itself among other regional players. Ultimately, a larger customer base equals larger amounts of data on customer behavior for better customer engagement, business intelligence, and, therefore, higher competitiveness. Offices were established in Hong Kong and Korea as early as of 2000, quite before the time of governmental calls for internet businesses to "go out" in the mid-2000s, so that the companies intrinsic globalizing initiatives led to planning R&D centers in China, the U.S., Russia, Israel, and Singapore (Choudhury, 2018; Vila Seoane, 2019). The firm's first joint research center overseas was launched with Singapore's Nanyang Technological University with a focus on developing AI application, backed by a US$15 billion R&D fund (Choudhury, 2018). Singapore is a strategic access point for technology and e-commerce diffusion of Alibaba's digital portfolio for obviously geographical reasons close to supply chains in Southeast Asia as well as Singapore's supportive government policies in favor of industrial needs and its high-quality human resource pool as discussed in the respective case study. Concerning e-commerce, Alibaba has held a majority stake in aforementioned Lazada since 2016, Southeast Asia's main e-commerce platform present in six ASEAN countries, with an initial US$1 billion investment and later becoming a subsidiary (Russell, 2017a), boosting market access through technical capacity building with Chinese experience around fast-paced logistics[18] and customer experience such as multilingual AI robots providing customer service in Chinese, English, Malay, Indonesian, Vietnamese, and Thai (Keane & Yu, 2018).

Interestingly, Singaporean e-commerce platforms become a competitive token

[18] Soo (2019) notes that knowledge transfer is reciprocal, as Alibaba needs to integrate new models of logistics in Southeast Asia in order to operate: Indonesia and Philippines are constituted of thousands of island with digital infrastructure being present but lacking in robust physical infrastructure, leading Lazada to supplement its e-commerce ecosystem with own logistics as opposed to Alibaba's outsourcing model.

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in accessing Southeast Asian markets for Chinese e-commerce players. Singapore-based e-commerce provider Shopee first started as primarily a C2C marketplace but has moved into b C2C-B2C hybrid model (Luo, 2017). It's parents company Sea Group filed for an IPO in New York for US$1 billion in 2017, with Chinese Tencent –Alibaba's tech competitor from home– holding a ~40 percent share (Lee, 2018; Russell, 2017b). With stakes in Lazada, Alibaba competes with Tencent holding shares in Shopee, both of which are among the leading e-commerce platforms across ASEAN countries. For instance, a survey in Indonesia revealed that 73 percent of parental target groups shop on Shopee while 51 percent do so on Lazada (Tay, 2018). Also, Shopee launched the China Marketplace offering access to products from Chinese retailers without shipping costs, directly competing with Lazada's Taobao repertoire.

4.5 Alibaba within the VoC concept

The success of Alibaba roots rather in entrepreneurial endeavors to deliver digital solutions than in protectionist state-intervention of the Chinese government as Asian data capitalism would suggest. Instead, Alibaba leveraged the emerging potential of the rapid spread of cheap ICT in China, enhanced connectivity and reduced transaction costs for businesses in even low-tier cities of the country facilitating participation in trade networks and reach customers across the country, coupled with the fast-paced development and wealth accumulation of the rising Chinese middle class and consumption pent-up demands. The development of innovative e-commerce business models is driven by market-demand and entrepreneurial spirit, and are not dictated through governmental investments in new business models.

> "[Alibaba] represents China's new capitalist elite who … can talk with world's political, business, and technology leaders as new visionary leaders in the new world order. Unlike the "state capitalists" (who are the bosses of large state-owned enterprises), the new capitalist elites all emerge in the digital era as bosses of digital conglomerates and drivers of the digital economy." (Keane & Yu, 2018, p. 4630)

Despite close cooperation with the government, the rationale is based on China's endeavors to build domestic versions of existing digital service such as Western e-commerce auction platforms like Ebay or domestic social media, rather than buying out competitors as it is common practice in the West, or restricting market access for foreign firms which is not the case in China either (Burns, 2018). This means that the

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nature of their market dominance is different to the digital market in the West and cannot be distinctively categorized within the CME-LME theory as suggested by the conceptual framework. Moreover, Alibaba's internationalization ambitions preceded the Chinese government's call to globalize media and e-commerce businesses, which is part of why Chinese policymakers realized that innovation does not come from within its SOEs and delegated digital governance to private companies while, nonetheless, exercising influence over the direction of applications through incentives, to support competitive digital ecosystems for the sake of high-quality jobs and innovation. However, the rationale does not fit the conceptualization of Asian data capitalism. Figure 3 contains a visualized form of positioning the case of e-commerce company Alibaba within the conceptual framework of the thesis and illustrated the public-private relationship in terms of digital governance.

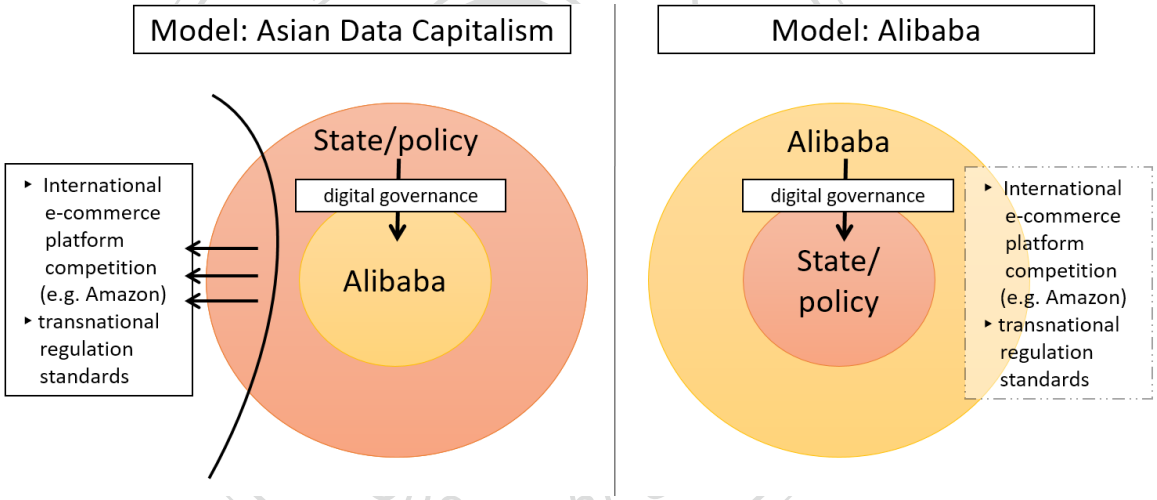

Figure 3 Contextualizing the Case of Alibaba within the Conceptual Framework
Source: the author

The Asian data capitalism hypothesis does not hold true because a) digital governance lies at the private sector level instead of digital technocracy steering the way towards digital ecosystems, b) transnational data and regulation standards are becoming more important than domestically mandated provisions for the sake of cross-border e-commerce facilitation, and c) the state is not the main stakeholder of the ecosystem and the e-commerce market identifies the digital utility and provides the infrastructure, e.g. investments in ASEAN's nascent e-commerce ecosystems. China lagged in its development of state regulations in regard to the digital utility, so that Alibaba and other tech giants act as regulators to administer the online environment and the Chinese government rather ratifies arrangements and alliances that Alibaba

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had already created, such as legalizing its arrangement with Chinese banks (Manjikian, 2020).

The Chinese government obviously does not intend to pick winners as competition between indigenous tech giants fits well into the government's objective of supplementing the overarching trans-continental infrastructure projects of the Belt and Road Initiative (BRI) to enhance trade also in the cyber-physical realm of e-commerce with a "digital Silk Road that involves the internationalization of Chinese internet firms across countries that are party to the [BRI]" (Vila Seoane, 2019, p. 1). In the years to come, the fastest-growing markets in the world –India, Indonesia, and Malaysia– are situated in Asia, and e-commerce supporting connectivity aims to ease free information flow, logistics, free cash flow, and seamless links between the virtual and physical parts of e-commerce network (Chen, 2017). Moreover, globalizing cross-border trade grows and calls for trade openness. ASEAN e-commerce can highly benefit from Chinese investments in hard and soft infrastructure, complementing each other through integration of SMEs and boosting emerging markets' participation and catch up rate. This fits well with the aforementioned *ASEAN Digital Integration Framework Action Plan 2019-2025* (AEM, 2019) with its key objective to establish inclusive and competitive, physical as well as digital supply chains, particularly for integrating small and medium-sized ASEAN enterprises. Thus, ICT infrastructure enhancement is to be improved for overall ASEAN peoples' socioeconomic participation, as well as enhancing and fostering existing platforms for peoples' integration to form an ASEAN "Digital Service Hub" by 2025 (AEM, 2019, p. 25). However, Alibaba's investments in the region, namely Singapore, and "infrastructuralization of platforms" (Plantin et al., 2016) are market-driven and contest the rationale of an Asian data capitalism.

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Chapter 5. Conclusion

5.1 Case study summary and implications

Economies in the Asia Pacific have great potentials for incorporating data as a new resource in their growth and development models, especially towards more inclusiveness through digital connectivity and incorporating smaller businesses in regional and global production networks. Therefore, policies must be formulated adequately to leverage this potential and implement national strategies towards digital economy models matching up with domestic conditions. If poorly steered, the digital divide can grow and give rise to new forms of social and spatial exclusion domestically and region-wide. Policy approaches vary. However, economies in the Asia Pacific certainly reflect a set of institutional configurations that derive from path-dependent forces and can be deemed conducive to emerging digital ecosystems. The export-led catch-up experience of Asian economies in the past has led to a sound manufacturing base of global importance, with Japan leading the regional catch-up phase and followed by the NIEs. Additionally, China rose to the colloquial status of the 'world factory' and has now become a global player in big tech. Most recently, labor offshoring occurred to the benefit of emerging Southeast Asian markets with rising incomes and increasing wealth. Asia is predicted to host two-thirds of the global middle-class by 2030. Growing incomes give rise to consumption aspirations of individual and personalized goods and services, and post-materialist aspirations including the "new customer experience". Big data enables business models to monetize on these trends through exploitation and fusion of data feeding business intelligence and prediction mechanisms like AI. Secondly, the amount of data is crucial to the creation of such systems. Machine learning, in particular, as applied in AI systems, feeds on these data. Generally speaking, the more data, the better the predictions. A spatial characteristic of the Asia Pacific includes that large parts of its population live in dense metropolitan areas that provide the public and private sector with aggregate data. This is conducive to developing and implementing AI technologies at scales, such as smart city systems or autonomous vehicles.

To effectively leverage the potential of AI technologies and generate data-derived value, a national manufacturing base remains a necessary condition to catch up or innovate. The manufacturing sector has been contributing largely to Asian economies' GDP growth and, as opposed to other developed countries, continues to

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do so whilst maturing and shifting towards knowledge-intensive industries. The case studies show that economies target this potential. China's *Made in China 2025* industrial upgrading strategy aims to achieve a large-scale improvement of general automation and notably its competitiveness in the production and manufacturing sector. The *Three-Year Guidance for Internet Plus Artificial Intelligence Plan* and backed by the *Three-Year Action Plan for Promoting Development of a New Generation Artificial Intelligence Industry* puts AI at the core of the upgrading process in manufacturing sectors, laying out timely guidelines and prompting the industry to propel R&D for breakthroughs in AI to create a next-generation internet infrastructure for smart factories and devices. In Japan, premier Shinzo Abe strives for economic revitalization to realize Society 5.0 that goes beyond industry 4.0. Singapore's manufacturing industry accounts for about 20 percent of its GDP and upgrading the semiconductor industry and high-tech computing capacity remains an important governmental target. Also, Korea holds a strong position in the global semiconductor industry with a diversified manufacturing base. Similar to China's 2025 strategy, *the I-Korea 4.0* roadmap defines industries and sectors that the government targets with their *innovation growth engine policy*, promoting smart factories and enhance production through AI in order to massively increase the value-added ratio of the manufacturing sector. As global production networks are reshuffled and China also starts to offshore labor, ASEAN's emerging economies can leverage data-driven off-the-shelf AI technologies to dramatically boost their own manufacturing sectors' productivity and further expedite the catch-up process. However, structural imbalances and the digital divide in ASEAN and within individual ASEAN states themselves can be tremendously large and there still is a need for enhancing digital connectivity through ICT infrastructure improvements. What all policy initiatives pronounce is to not simply focus on developing AI software but to particularly complement it with the hardware, such as South Korea's smart semiconductor ambitions, or generally achieve higher automation levels through AI and IIoT system applications in the manufacturing process. Prioritizing to upgrade the domestic manufacturing sector epitomizes the ambitions to maintain the "factory Asia" model in tandem with shifting toward "value-added factory Asia" as proposed by (Kam, 2017). The policy objectives of AI implementation in manufacturing combines a holistic and inclusive approach of boosting productivity, incorporating small and medium enterprises in the production network through ICT

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enabled low transaction costs particularly in the ASEAN region, expanding and reshuffling production networks for greater consumer welfare, and nurturing nascent digital ecosystems through value-adding digitized products.

While this upgrading process lifts the economy up the value chain, disrupting technologies like AI that automate core businesses are associated with changing labor environments and job displacement. To ensure an inclusive development trajectory throughout the transition to the digital economy, arising labor issues have been addressed, respectively. Chinese policymakers realized that innovation in AI does not come from within its SOEs and delegates digital governance in R&D to private companies while exercising its influence over the direction of research through incentives for picked national heroes in an attempt to create more competitive digital ecosystems for high-quality jobs, thus, binding financial support to the overarching objective of becoming an AI superpower. Korea and Japan similarly aim to strengthen fundamental AI research through cooperation between universities and the private sector in order to nurture their domestic talent pool. Both countries lack in innovative startup ecosystems around AI, partly due to yet again path-dependent forces that have formed institutional complementarities such as conglomerates steering innovation and remuneration systems based on seniority rather performance and creativity. Singapore already possesses a vivid startup ecosystem due to investment-friendly environments and a strong knowledge-based economy with tech-savvy and highly educated human resources. A fifth of full-time jobs in services such as banking and insurance could be displaced, more than anywhere in ASEAN. Thus, the *AI Singapore* initiative is a top political priority trying to enhance its digital ecosystem with programs such as *AI for Everyone* to provide up to 100,000 Singaporeans with knowledge on how to incorporate AI in their businesses, or the *100Experiments* program connecting research and businesses to jointly develop and commercialize AI solutions.

Generally, all the policies under scrutiny take an application-oriented and commercial approach to AI, however, this does not exclude the social implementation of AI technologies. The policies in the case study emphasize and promote the added value for society derived from the technology's marketability. In Korea and Japan, deregulation has been implemented geographically in strategic special zones to try out new business models and generate necessary data for further research, commercialization, and nationwide usage upon success. Both countries stress AI-solutions as a remedy to social issues, namely their fast aging societies. Japan's

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Society 5.0 concept is considered as the next step in human evolution and job displacement through AI is not perceived as a threat against the backdrop that automation and smart devices can help solve issues around Japan's aging society. China faces similar demographic issues. Therefore, all countries identified strategic application fields for social AI and set out incentives to spark consumer demand in these sectors, including public services, healthcare, and transportation. This entails emerging patterns of digital platformization, coined as platform capitalism, that takes over the states' role as infrastructure provider for the digital utility. Governments reinforce this trend through policies to facilitate the fusion of public and private sector data as they perceive it as a driver of innovation. Korea's *AI Hub* program provides access to ready-to-use high-quality datasets of CCTV footage and medical images for academic or business research and AI training; Japan's *Basic Act for the Advancement of Public and Private Sector Data Utilization* involves the entire administration to be digitized and public and private data will be made available to the private sector; Singapore's *Smart Nation Initiative* merges data from the public and private sector to match people's profile with jobs and career recommendations to nurture the AI talent pool; for the rest of ASEAN, no such mechanism was identified within the e-ASEAN program, but may exist in individual member states. The Chinese government partnered up with partly state-owned voice recognition developer iFlyTek providing it with biometric data and also supports the AI platform City Brain by Alibaba Cloud to realize truly smart cities, with complementing data sourced from Apollo by Baidu for autonomous driving, or Tencent's AI platform for a smart public health system.

The fusion of public and private data raises questions of data ownership, which has been addressed by governments, respectively. Singapore and Japan amended their copyright regulations to allow duplication of copyrighted data for third party information analysis such as training AI algorithms for commercial applications. The distinction in the Korean and Chinese copyright is not yet clear and is set to be amended in 2020. The *ASEAN Digital Integration Framework Action Plan 2019-2025* aims to propel policy streamlining and transparency of domestic laws with particular regard to intellectual property rights mainly regarding e-commerce platforms. Concerning personal information and data protection, the European Union's GDPR was used as a benchmark for data privacy protection in this study. Singapore's *Personal Data Protection Act* has no definition of 'sensitive personal data' and is less strict than the GDPR on matters of consent provision for data collection and handling

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for it was enacted for purely economic purposes as opposed to the GDPR's notion of privacy as a human right. Japanese and Korean regulations are on par with GDPR provision to a considerable extent, mostly addressing the anonymization of personal data as well as data subjects' rights requiring consent to collect, process, retain information for corporate utilization. Japan amended its *Personal Information Protection Act* in 2017 not least due to the 2019 EU-Japan Economic Partnership agreement to facilitate cross-border data flows. There are no unifying regulations regarding data protection across ASEAN countries and provisions differ territorially. The APEC Cross-Border Rules System, however, requires business activities to comply with the *APEC Privacy Framework* (2017) setting forth basic guiding principles of privacy protection to ensure a certain extent of synchronized information laws. These principles have been incorporated in most APEC members' jurisdictions, namely Japan, South Korea, Singapore, and China, and in ASEAN states, such as Indonesia, the Philippines, Vietnam, and Malaysia.

Data protection has gained distinguished relevance, not least because of recent incorporation in free trade agreements, namely with regard to e-commerce, digital products and cross-border flows of personal data and information. However, unconcise definitions for digital products and services hamper enhanced policy streamlining in the Asia-Pacific. The WTO definition of digital products and electronic transmissions is ambiguous and intersecting. Thus, several countries have resorted to bilateral preferential trade agreements to clarify the context, leading to a growing heterogeneity in definitions. This is problematic in the context of economies entering into free trade agreements such as CPTPP and RCEP, which are seen as important drivers of market integration in the Asia Pacific. If definitional heterogeneity remains, these inconsistencies may be reflected by individual countries' approach to digital policymaking even on a domestic level and, internationally, result in costly dispute settlement procedures. RCEP falls short of significance in digital trade as it does not promote cross-border data flow for businesses nor prevent customs duties on digital products. CPTPP does give clear directions. Through RCEP, China could fill this gap and set regulatory standards if definitional heterogeneity sustains. E-commerce is thriving and China is committed to enhancing cross-border e-commerce cooperation as the ASEAN–China Free Trade Area (ACFTA) was supplemented by respective provisions. In this case, personal data security could not be fully ensured due to existing legislation that the Chinese government could force

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companies to hand over data to comply with specific regulations. However, digital policymaking is market-oriented and adapts to industrial needs. Inter-governmental cooperation beyond the scope of deal-making merely exists. ASEAN shows the most efforts in policy streamlining, most notably due to Singapore's special role and aspirations for an integration of the CMLV. However, AI-related content was not found in any of the guiding principles among ASEAN frameworks and is yet to be integrated.

5.2 Discussion: Revisiting the conceptual framework

This thesis proposed the term 'Asia Pacific 4.0' as a geo-economic construct that denotes the cyber-physical economic integration in the region towards the digital economy, from "Factory Asia" to "Value-added Asia". In doing so, the research focused narrowly on the interlinked political and economic spheres affecting governments' policy approaches to the digital economy in an attempt to test the hypothesis whether STI policies in the Asia Pacific show idiosyncratic regional characteristics that would justify Asian data capitalism as a distinct variety of capitalism. The assumption of regional characteristics is based on the theoretical framework informed by VoC perspectives on the developmental state model and related path dependence, which has led scholars to categorize Asian economies neither as fully coordinated nor liberal market economies (LME and CME, respectively), nor has scholarship agreed on whether Asia's economies constitute hybrid forms or not. The conceptual framework introduced Asian data capitalism as a technocratic and restrictive form of digital economic governance for the sake of developing domestic ecosystems through protection and exploitation of data as a resource, pertaining to path dependence.

An argument can be made that the case studies reveal that Japan, South Korea, Singapore, and China's 4.0 frameworks extensively target digital ecosystem policymaking "to ensure an effective digital ecosystem and an open, stable and enabling environment for the digital economy" whereas ASEAN policy frameworks primarily encompass digital infrastructure policy "to ensure a pervasive and effective [ICT] infrastructure for the digital economy" (Heeks, 2018, p. 11). ASEANS digital infrastructure ambitions and the digital ecosystem policy both rely on collaborative approaches: from an industry perspective, governmental trade arrangements such as

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the CPTPP, RCEP, and the ASEAN-China FTA facilitate and enhance digital trade and/or customs duty relief in the region, thus, they support the LME model through digital governance at the private sector level with relaxed transnational data regulations for industries to thrive and extend regional supply and production networks. For instance, e-commerce and associated businesses are provided with agency to identify the scope of digital utility and customer welfare through platformization. With ASEAN-led ACFTA, opening up to China's ambitions in cross-border e-commerce brings "mutual benefit [and] win-win cooperation among developing countries" (Liang & Zong, 2019), but simultaneously does not neglect further regionalization processes through supplementary trade agreements such as RCEP or CPTPP. In tandem with trade policy, there are pronounced efforts to formulate relaxed or at least domestic data regulations streamlined with common standards globally to facilitate not only regional but global integration. Reduced transaction costs due to ICT and digitalization enable economic empowerment and inclusion of SMEs particularly to reach out to customers and other businesses, for instance, through online shops and transboundary e-commerce platform participation. So far, regulatory heterogeneity lets countries resort to bilateral and multilateral agreements to set forth their own definitions and interpretations of digital products, however, the research shows that these are in large parts similar to each other and converge towards emerging transnational data regulation standards. According to the conceptual framework, the above outlined liberalizing elements do not point towards Asian data capitalism as a distinct and revived variety of a developmental capitalism, but it validates the general VoC typology by Hall and Soskice (2001) in that there is a global shift towards LME convergence incrementally occurring at different speeds across the region.

The platform economy mainly encompasses labor-intensive service sectors such as e-commerce including neighboring industries from logistics to customer service. Not only can AI and big data business intelligence enhance the efficiency of such ecosystems through competitive customer experiences and new business models around big data, it can also enlarge the trade volume itself through these enhanced and targeted user acquisition mechanisms, hence, human labor is increasingly required to meet the demand. This has repercussions in that platforms, namely in e-commerce, particularly prefer to operate in economies with relaxed data regulations to boost

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businesses that rely on customer data exploitation. Nonetheless, standards are required to a sufficient extent for trust-building among users and streamlining operational processes, especially in a transnational context. In terms of Asian data capitalism, an argument can be made that in order to establish and boost domestic platformization and protect it from overseas competitors, path-dependent development experiences would prompt policymakers to restrict big platforms from abroad to operate domestically. However, drawing on examples from the literature review, the assumption of an Asian data capitalism that protects domestic platform ecosystems can be contested: U.S.-based ride-sharing service Uber was granted access to the Chinese market, but outplayed by the local brand DiDi through cut-throat competition, and not an intervening Chinese state. Similarly, other economies do not restrict foreign platforms to enter their markets either, as exemplified by Amazon's dominant presence on the Japanese market, or Indonesian multi-service and payment platform Gojek and Singapore's e-commerce service Lazada, both of which operate across Southeast Asia. Thus, current market tendencies are not impeded by protectionist digital policymaking. Contrarily, they are considered conducive to the evolution and supplementation of domestic ecosystems through competitiveness and activation of cross-industry participation.

As for localization of personal information and business data, Asian data capitalism can be contested in that conjectures do not hold true about developmental state-informed policy approaches towards restricting foreign businesses' and MNC's utilization of domestic data for their operations. Contrarily, digital governance in fields such as e-commerce, smart city connectivity, and general AI technology development is transferred to the private sector as shown even in the case of China. Institutional frameworks around digital policymaking in the Asia Pacific target opening these production networks to incorporate smaller enterprises and open-source public data. These patterns do not fit into the category of Asian data capitalism as set forth by the conceptual framework; and neither do trade policies regarding personal data laws nor digital trade provisions as shown by the examples of RCEP and CPTPP. For instance, a protectionist rationale for cross-border flow of personal information under Asian data capitalism would require businesses to restrict these data flows as an indigenous resource. But in fact, the rationale for enhancing transnational privacy standards, such as the APEC Cross-Border Rules System, points to the opposite:

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opening up e-commerce fields and make internet transactions secure to facilitate trade of digital products for trans-boundary customer welfare.

Also, copyright laws are relaxed rather than tightened in order to exploit and enhance data and AI applications. Singapore, Japan, and South Korea explicitly amended their laws to allow AI-derived duplications and processing of copyright material, and China ruled its first unprecedented case in favor of AI in early 2020. For instance, as of 2019, the Ministry of Law Singapore (2019) amend the Copyright Act "to better support creators and the use and enjoyment of creative works in the digital age" (paragraph 1), legitimizing duplication of copyrighted content for the purpose of industries' business intelligence. Similarly, Singapore, Korea, and Japan explicitly open-source state data not only for domestic companies' access and usage.

Moreover, these economies welcome strengthening cross-border data flows as epitomized by, for instance, the EU-Japan Economic Partnership agreement promoting legally secured digital connectivity, or ASEAN's data storage capacities on high-performing data centers in Singapore from which both economic entities benefit mutually: from an industry perspective, Singaporean hardware firms and semiconductor manufacturers benefit from providing their physical endowments for high-performing data servers as well as software companies from providing cloud and edge computing services, whereas ASEAN's emerging digital platforms and businesses participating in e-commerce can benefit from accessing those regional data servers and related services despite lacking own sufficient ICT infrastructure. Under Asian data capitalism, this cross-border data localization pattern would not occur due to protectionist and domestically mandated data standards and policies as set out in the conceptual framework of this thesis. Rather, governments converge towards the liberal model in order to leverage platforms with special regard to Southeast Asia's booming cross-border e-commerce, because they realize that this positively impacts associated industries and sectors domestically, for instance, through job creation in existing logistics firms and networks, or platform labor-related occupations in the service sector and beyond.

China could be seemingly considered an outlier certainly fitting into the Asian data capitalism conceptual framework for reasons of indirect incentive-backed winner-picking and state guidance as well as selective and restrictive cross-boundary data flow facilitation. However, Chinese businesses' expansion into overseas markets and ongoing trends of servitization domestically entail alignment with local interests

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abroad and regulatory environments in those markets, such as overarching schemes like the APEC Cross-Border Privacy Rules System. Even in the case of China, it is thus international markets that identify digital utility and confront China with compliance requirements such as GDPR provisions and ethical principles in AI application.

Relying on a simple definition model of economic integration by Pinder (1972), I conclude that AI and related data policies in the Asia Pacific are certainly propelling negative regional integration through the removal of restrictions on the movement of digital goods and services, as well as personal information, more so as stipulated by CPTPP than by RCEP. However, a lack of policy coordination and international common standards entails a) regulatory heterogeneity and b) forgone opportunities to fully leverage nascent ecosystems. However, convergence towards policy models with principles pertaining to advanced data-handling frameworks such as the GDPR and APEC Privacy Framework can be expected in the Asia Pacific since they intersect largely and point towards global commons in data protection that promote the cross-border flow of data and digital goods. No distinguished Asian standards are currently under discussion. Nonetheless, the rapid proliferation of ICT and AI systems calls for closer attention to streamlining policies, with particular regard to ASEA's emerging member states and their integration into digital networks and value chains. With data as a resource, the Asia Pacific has a lot of potential to develop AI solutions for local issues due to a) a growing middle-class with pent-up consumption demands, namely in China and Southeast Asia, and b) highly urbanized areas that are conducive to collecting vast amounts of data as a resource for innovative technologies. Generally, STI policy regarding AI is very diverse and dependent on, for instance, demographic conditions such as social AI implementation to counteract an aging society in Japan or Korea, or social credit score schemes as set out by China. This vast spectrum of indigenous conditions itself calls for the contestation of a general attempt to identify a common 'Asian' policy approach. However, a neoliberal shift and globalizing trading networks, in which the Asia Pacific has been firmly integrated over the past, seem to have led economies all over the world to engage in LME forms of capitalism with "sustained superior economic and social performance … in a variety of institutional fields [such as employment, legal architecture, innovation systems, social protection systems, and state-economy relations]" (Boyer, 2005; Carney et al., 2009, p. 367). The core characteristics of

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data, that is decentral generation, decentral localization, and decentral reproduction, may well prompt economies in 21st century to follow liberal models of economic governance and digital agency at the market and private sector-level, in order to position themselves within the global capitalist mode of production. In conclusion, the null hypothesis cannot be rejected since regulatory heterogeneity and structural inequalities in ICT infrastructure require different policy approaches and, thus, contest an institutional Asian data capitalism as a distinct emerging variety of capitalism. Global trends towards liberal market economy models of governance can be certainly observed in the Asia Pacific.

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Appendix 1

Table 1 Literature highlighting cooperation as key factor for economic integration

General cooperation/ not specified	Within-country B2B or government-to-business cooperation	International cooperation B2B or government-to-government
(APEC, 2017) (Knight, 2019) (Lundvall, 2017) (Macaulay, 2018) (Shafto, 2016) (Sheng, 2007)	(Chen & Qiu, 2019) (Chitturu et al., 2017) (Kuo et al., 2019) (Lee & Shin, 2018) (Schot & Steinmueller, 2018)	(APEC, 2017) (Bonapace & Martinez-Navarrete, 2012) (Chitturu et al., 2017) (Hawksworth & Fertig, 2018) (Knight, 2019) (Leng, 2017) (SCP, 2019) (Sheng, 2007) (Thun & Sturgeon, 2017) (Yoshimatsu, 2007)

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