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Data Governance, AI, and Trade: Asia as a Case Study

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1. Introduction

The arc of history seems to be bending again towards the dynamic nations of Asia (Gordon: 2008). The countries and territories of the Asia Pacific region are both a locus for trade and a source of technology fueled growth. In 2017, Asia recorded the highest growth in merchandise trade volume in 2017 for both exports and imports (WTO: 2018, 32). UNCTAD reports that exports of digitally deliverable services increased substantially across all regions during the period 2005–2018, with a compound annual growth rate ranging between 6 and 12 per cent (table III.1). Growth was the highest in developing countries, especially in Asia (UNCTAD: 2019, 66)

Artificial intelligence (AI) is already a leading source of growth for many Asian countries. The AI market in the Asia Pacific was estimated at around US $450 million in 2017 and is expected to grow at a compounded annual growth rate of 46.9% by 2022 (Ghasemi: 2018). Several analysts believe Asia's AI growth will soon overtake the US (Lee: 2018; Ghasemi: 2018)

Why are so many policymakers, corporations, and research institutions focusing on AI as a tool to facilitate economic growth? They understand that firms that move quickly to adopt AI can realize major competitive advantages in both manufacturing and services, as example labor cost savings, improved services, and lower error rates (Chitturu et al. 2017, 12). The consulting firm PwC predicts that adoption of AI could increase the global gross domestic product measure by up to 14 percent by 2030 through productivity gains in business process automation and augmentation of human labor (Sizing the Prize: 2017; Barton et al.: 2017).

But the countries that are nurturing AI do not only provide support for research and development or venture capital investment. According to analyst Joshua New, these countries are developing policies that encourage a healthy ecosystem of AI companies as well as encourage firms to test AI. These countries are also investing in robust AI inputs—including skills,[1] research, and data (Migrating: 2018, New: 2018). Herein I argue that governance at the domestic and international level matters. Success in AI also requires that states provide their citizens with capacity to utilize data (skills, internet infrastructure; good governance; and effective data governance—which includes rules regulating the collection, sharing and use of various types of data at the national and international level as well as AI plans (Aaronson: 2018a and 2018b).

In this analysis, I show that the countries of Asia represent an interesting contrast: They will be among the first countries to have rules facilitating AI in trade agreements that make the free flow of data across borders a default (with exceptions). However, many states in Asia do not have a transparent, effective and interoperable system of data governance for two types of data — personal data and public data. These two types of data are widely used in AI. AI systems require an adequate supply of good quality data. Nor do many countries have data or data-governance know-how. Hence, some Asian countries are under-prepared to govern the cross-border services that underpin AI. These countries tend to be less wealthy, less developed. Some are also less

[1] Countries can encourage AI skills through education labor, and immigration policies.

democratic (Aaronson: 2018b). However, we are not arguing that greater wealth and/or democracy are measures of success in AI. Some authoritarian regimes that invest heavily in education and research are very successful in encouraging AI.

We begin by defining AI and the various types of data utilized in AI. We then assess the trade agreements governing data in Asia and examine domestic policies governing personal data. We next go country and region-specific, using several metrics that can help us better understand Asian country performance and potential related to AI. Some of these metrics describe capacity to create and utilize AI (such as education) while others describe the governance of the data that underpins AI. Finally, we develop some conclusions.

2. Definitions

AI is a broad term that is used to describe computer systems that can sense their environment, think, learn, and act in ways that humans do. Organizations use AI in digital assistants such as Apple's Siri; chatbots such as H&M's chat bot assistant[2], and machine learning applications such as Waze which can direct users through traffic jams. AI applications use computational analysis of data to uncover patterns and draw inferences. These applications in turn depend on machine learning technologies that must ingest huge volumes of data (BSA: 2018; Artificial Intelligence: 2017).

AI applications do not only have business utility. They can serve the public good. As example, in 2018, Google partnered with the Rajavithi Hospital, which is operated by the Ministry of Public Health in Thailand, to use AI to detect diabetic retinopathy in Thailand[3]. In another example, an Indonesian NGO, Gringgo, is creating an image recognition tool to help informal-sector waste collectors and independent waste management companies increase recycling rates and better integrate with city sanitation crews. It will use this tool to improve and expand community trash collection and reduce ocean plastic pollution.[4]

To build AI or machine learning systems, engineers need lots of data, (data volume), variety of data (data variety), and good data that is correct (data quality and veracity). AI systems are not able to distinguish between reliable and unreliable data If the algorithms are built on incorrect, unreliable data, these systems will come up with incorrect or misleading results (Data Quality: 2018; Leetaru: 2018). The figure below describes six different sources of data that can be used in AI.

< Figure 1 here>

In building AI systems, researchers rely heavily on two types of data: public and personal data. They can obtain this data from users (personal data) or government (personal and public data, as example census records). Herein, we focus on those types of data.

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[2] This chatbot can help you find what you are looking for, it can also suggest clothing and help you pay.Bot-hub, " H&M: official chatbot review, October 25, 2016, https://bot-hub.com/reviews/official-chatbot-review

[3] Google in Asia, AI for Social Good in Asia, https://www.blog.google/around-the-globe/google-asia/ai-social-good-asia-pacific/

[4] https://gringgo.co/about and https://ai.google/social-good/impact-challenge

Public data can be defined as information collected, produced or paid for by the public bodies. Public data is essential to good governance and democracy, and much of the data governments collect and assess should be in the public domain (BSA: 2018; Artificial Intelligence: 2017; World Policy: 2013). However, government officials have the right to limit access to data that is private or that should be kept secret for national security reasons (Ransbotham: 2015; World Policy: 2013). Researchers (whether in the public, private or academic sectors) should have free access to public data and it is helpful if it is available in machine-readable form, so it can be easily utilized by computer programs.[5]

While there is a generally shared notion of public data, nations define personal data differently based on national laws (Girot: 2018; Data Protection: 2017). As example, the EU defines personal data as any information that relates to an identified or identifiable living individual. Personal data may be directly linked to a person, or indirectly linked to a person (e.g. when you can use a year of Amazon purchases to guess a person's identity) (Adequacy: ND). In contrast, the US considers personal information data that can reasonably be used to contact or distinguish a person, including IP addresses and device identifiers (Data Protection: 2017).

Many data driven services are built on access to large databases containing personal data, which people provide in return for online services such as Google Translate and Netflix. As systems learn from the data provided, that data may be utilized in different ways for multiple purposes, some unrelated to the needs of that person (Datatilsynet: 2018; Aaronson: 2018b). However, most people are not cognizant of the real value of their data (Meyer: 2018; Aaronson: 2018b).

Meanwhile, although many algorithms are in the public domain, most AI-centered innovation is based on a business model where training data is considered proprietary and it is protected under intellectual property rules. Consequently, many firms argue that they don't need to make their algorithms public (as example through open data platforms) (Rahman et al. 2018; Thereaux: 2017). But some countries, such as the EU are developing new forms of regulation that empower people to control their data and to demand explanations regarding how firms use that data in AI and other services.

Hence, there are several types of governance that are essential to encouraging AI: personal data protection, trade rules governing cross-border data flows, AI plans, and open data strategies. We begin by discussing how trade rules may affect cross-border data flows and the development of large data sets essential for AI.

3. The State of Trade Rules and its impact upon AI

Trade agreements regulate AI by regulating the provision of cross-services built on data, such as data processing and other computing services (Burri: 2017; Drake: 1993). Trade agreements can affect AI in several ways: by enabling the creation of large global training data sets; by reducing barriers to cross-border data flows; by clarifying how and when governments can demand access

[5] As example, http://data.europa.eu/euodp/en/about

to algorithms that may be proprietary; and by limiting forced technology transfers of intellectual property, such as firm specific algorithms (Aaronson: 2018b; Meltzer: 2018).

The most international trade agreement, the World Trade Organization (WTO), includes several agreements that address issues affecting the data that underpins AI. These include the Information Technology Agreement; the Agreement on Trade-Related Aspects of Intellectual Property Rights; and the General Agreement on Trade in Services (GATS). The GATS is the most relevant to the new data-driven services, with chapters on financial services, telecommunications, and computer services. But it predates the invention of the internet and world wide web and says nothing explicit about cross-border data flows. Nonetheless, dispute settlement bodies have interpreted the agreement as applying to various computer and telecommunications services, including AI.

WTO members have been working for several years to update the WTO but have made little progress (Burri: 2017; Ciobo: 2017). Asian countries have taken the lead in trying to help update the WTO's e-commerce provisions. At the 11th WTO Ministerial Conference in Buenos Aires in December 2017, Australia, Japan and Singapore, with the support of 67 other WTO Members, launched the E-Commerce Joint Statement Initiative. They hoped to encourage a consensus on what members should negotiate and how.[6] To further that effort, countries have issued proposals and background papers. But many of these members do not clearly distinguish between e-commerce and digital trade.[7] Some African countries want to limit the discussion to e-commerce alone (defined as goods and services delivered online).[8]

However, some countries want to go further with multilateral talks at the WTO. But they disagree as to what to include and how to proceed. The EU and Singapore focused on establishing an enabling environment for e-commerce (and ensuring it would not be taxed), whereas other countries such as Japan, Taiwan, Brazil, Costa Rica and the US recognized that trade in data is something different and would require greater discussion of the appropriate enabling environment for such flows.[9] Some nations urgently want clear rules governing the exchange of data, others want a clearer sense of what they will need to do to facilitate data-driven growth, and still others are more focused on bolstering e-commerce. The government of Australia summed this up well. "The scope of e-commerce provisions has changed as digital trade has developed rapidly over time. In Australia's older agreements, these commitments generally focused on aspects of each country's domestic regulatory system to ensure that online commerce was not treated any differently to physical commerce. In more modern agreements, Australia seeks commitments that also address a broader range of cross-border issues, such as commitments to allow the flow of data across borders and prohibitions on requirements to store data locally."[10]

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[6] All WTO documents relevant to e-commerce discussions are at https://www.wto.org/english/tratop_e/ecom_e/ecom_e.htm

[7] https://www.wto.org/english/thewto_e/minist_e/mc11_e/sjf_india_pos_paper.pdf

[8] https://docs.wto.org/dol2fe/Pages/FE_Search/FE_S_S009-DP.aspx?language=E&CatalogueIdList=240318&CurrentCatalogueIdIndex=0&FullTextHash=371857150&HasEnglishRecord=True&HasFrenchRecord=True&HasSpanishRecord=True

[9] WTO, Proposals on Digital Trade as of July 6, 2018, https://drive.google.com/file/d/1f9WCOfw_Pa_ZLo4j4qsruqzxzNgbMZRI/view

[10] https://dfat.gov.au/trade/services-and-digital-trade/Pages/the-future-of-digital-trade-rules-discussion-paper.aspx

Despite these differences on January 25, 76 WTO members including China agreed to commence e-commerce talks. The US insists any language on data-flows must be ambitious and go beyond e-commerce to regulating new data driven services. Japan wants a two-tiered approach, which would allow members to make less ambitious commitments, while those that want to liberalize more, could (Fortnam: 2018; Kihara: 2019).

But many countries have not sat idly by as the members of the WTO debated. The United States, EU, Australia, Canada, and other nations have placed language governing cross-border data flows in e-commerce chapters of their free trade agreements. As the data driven economy has expanded in importance, the US, Mexico, Canada, the EU and Japan have recently renamed these chapters "digital trade chapters."

As of September 2019, there are two trade agreements with binding language governing cross-border data flows. Japan, Singapore, Australia, Malaysia Brunei, Vietnam, and New Zealand participate in the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP) . The agreement includes provisions that make the free flow of data a default, requires that nations establish rules to protect the privacy of individuals and firms providing data (a privacy floor), bans data localization (requirements that data be produced or stored in local servers) and bans all parties from requiring firms to disclose source code.[3]

EU-Japan, which went into effect February 1, 2019 represents a different approach to regulating the cross-border data flows that fuel AI. It includes binding provisions on cross-border data flows, and a ban on data localization, but does not include language on AI or on public data. [11] After months of negotiation, the EU and Japan agreed to recognize each other's data protection systems as 'equivalent', which will allow data to flow safely between the EU and Japan. The EU notes that "This mutual adequacy arrangement will create the world's largest area of safe transfers of data based on a high level of protection for personal data. With this agreement, the EU and Japan affirm that, in the digital era, promoting high privacy standards and facilitating international trade go hand in hand" (European Commission: 2018).

No Asian nation participates in NAFTA 2.0, an update of the free trade agreement among Canada, the US and Mexico. But one can see how both EU Japan and CPTPP influenced its digital trade language. The US was determined to include the most up to date "gold standard" language. The trade agreement explicitly bans mandated disclosure of algorithms as well as source code in the digital trade chapter. However, the agreement does not preclude a regulatory or judicial body from requiring divulgence of source code or algorithm if necessary, for legal reasons, if the nation has established safeguards against unauthorized disclosure.[12]

Policymakers included several new provisions. First, the chapter includes language that explicitly defines algorithms and regulates data to facilitate the needs of those who seek to use public data to foster innovation. It defines algorithm as a "defined sequence of steps, taken to solve a problem

[11] EU Japan Economic Partnership Agreement, http://ec.europa.eu/trade/policy/in-focus/eu-japan-economic-partnership-agreement/. The agreement is at http://trade.ec.europa.eu/doclib/docs/2018/august/tradoc_157228.pdf. Chapter 8, SECTION F
Electronic commerce (Articles 8.70 to 8.81), see http://trade.ec.europa.eu/doclib/docs/2017/july/tradoc_155727.pdf.
[12] Article 19.16, Digital Trade Chapter

or to obtain a result" and 'public information,' which it describes as "non-proprietary information including data held by the central government."[13] In recognition of the importance of public data to AI, the agreement also includes the following language related to 'Open Government': "The Parties recognize that facilitating public access to and use of government information fosters economic and social development, competitiveness, and innovation." Hence when possible, they will provide public information including data that is in a machine readable and open format and can be "searched retrieved, used, reused, and redistributed."[14] If approved by the signatories, this language es is likely to have significant effects on future agreements.

Like most trade agreements, the CPTPP, EU Japan, and NAFTA 2.0 also include exceptions, where governments can breach the rules delineated in these agreements to achieve legitimate domestic policy objectives. These objectives include rules to protect public morals, public order, public health, public safety and privacy related to data processing and dissemination. However, governments can only take advantage of the exceptions if they are necessary, performed in the least trade-distorting manner possible and do not impose restrictions on the transfer of information greater than what is needed to achieve that government's objectives.

It is too early to assess if any of these agreements limit digital protectionism-laws or regulations that limit or ban cross-border data flows. Many Asian countries including China, Indonesia, Vietnam, Malaysia, and India have adopted, or are considering laws requiring that data generated locally on their citizens and residents be kept within their geographic boundaries and remain subject to local law (Girot: 2018, 6, 119, 129-132, 222.) China, Brunei and India have laws which demand that data generated inside the country should be stored on servers within the country (Girot: 131, 222).

Finally, China is establishing rules for cross-border transmission of personal information. Officials have put forward draft "Measures for Security Assessment of Cross-border Transfer of Personal Information and Important Data" and draft "Guidelines for Data Cross-Border Transfer Security Assessment." These regulations are based on the Communist Party's vision--that data is a strategic resource that must be protected in the interest of national security and social stability (Hong: 2018). As delineated in the most recent drafts, these regulations apply to any company that is a network operator engaged in domestic operations. To transfer personal information outside China, a network operator must first obtain consent from the subject of the personal information. This consent must either be in writing or by some other sort of affirmative action by the subject of the data (Xia: 2018).

These regulations have not been well-received internationally. Many foreign firms and governments have objected to the law and proposed regulations, arguing that they will increase uncertainty and raise costs (Huifeng: 2018; Balke: 2018). The WTO has already had several discussions about the market access implications of the law (WTO Council for Trade in Services Report: 2017). Vietnam has also passed a cybersecurity law that went into effect January 2019. The law seeks to regulate data processing methods of technology companies that operate in

[13] Article 19.1, Digital trade Chapter

[14] Article 19.18, Digital Trade Chapter. Ironically, the US has not published this chapter on USTR web site. https://www.international.gc.ca/trade-commerce/assets/pdfs/agreements-accords/cusma-aceum/cusma-19.pdf

Vietnam and restrict the Internet connections of users who post "prohibited" content (Olsen et al: 2018; Nguyen: 2018).

In sum, several Asian nations have put in place domestic and trade policies to facilitate cross-border data flows. But most countries have work to do. In the next section, we describe data governance and AI capacity.

4. Country and region specific analysis

Our research strategy was as follows: first we limited our initial analysis to the 38 countries in the Asia Pacific region, as listed by the World Bank.[15] We included every country that is a signatory of at least a trade agreement that governs data. From that initial 38, we chose 18 countries which we then divided into 3 groups based on World Bank income categories. These 18 represent a mix of both income and governance type as well as signatories and non-signatories of a trade agreement with binding rules governing data. Regarding income, 8 are lower middle -income, 3 upper middle income and 7 are high income economies, according to the World Bank. This division allows us to see if income is associated with better performance on various metrics of governance of data.

We then relied on the Economist Intelligence Unit (EIU) to classify each country by type of regime. EIU divides countries into 4 groups: (i) full democracies, (ii) flawed democracies, (iii) authoritarian regimes and (iv) hybrid regimes.

i. Full democracies are nations where civil liberties and basic political freedoms are thriving.

ii. Flawed democracies are nations where elections are fair and free and basic civil liberties are honored although they may have significant faults in other democratic aspects such as low levels of participation in politics or issues related to the functioning of governance.

iii. Authoritarian regimes are nations where political pluralism has vanished or is extremely limited. These nations are often absolute monarchies or dictatorships. These states may have some conventional institutions of democracy but abuses of civil liberties are common.

iv. Hybrid regimes often do not conduct free and fair elections. These nations suffer from widespread corruption, media harassment, anemic rule of law, and more pronounced faults than flawed democracies (Economist Intelligence Unit: 2016, 1).

Here again our 18 countries provide a good mix. Of our 18, 6 are authoritarian states, 8 flawed democracies, and two are full democracies (among the highest ranks—Australia and New Zealand, as Table 1 indicates.) Thailand is considered a hybrid regime, while EIU did not have data on Brunei.[16] Six of the countries (or one third) participate in a trade agreement with binding provisions on data.[17]

We then assessed each country based on several metrics which we believe illuminate whether a country or group of countries have the expertise and capacity to create a data-driven economy such as that needed for AI. The findings can be found in Table 1 below.

[15] https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups
[16] The Democracy Index, https://en.wikipedia.org/wiki/Democracy_Index.
[17] Australia, Japan, Malaysia, New Zealand, Singapore and Viet Nam are members of CPTPP. Japan also signed Japan-EU EPA with the EU.

<Table 1 here>

4.1. The Importance of Human Capacity to Effective Data Collection and Analysis

For our country specific analysis, the first metric we utilized is the Global Human Capital Report Know How Sub-Index, which is a perception-based metric developed by the World Economic Forum. This index measures a country's ability to develop and utilize a highly skilled work force. Hence it tells us something about whether a country has enough expertise to build data driven sectors such as AI. The World Economic Forum noted that "the leaders of the Index are generally economies with a longstanding commitment to their people's educational attainment. Unsurprisingly, they are mainly today's high-income economies" (World Economic Forum: 2017, vii). Countries are ranked on a scale of 1-100. Our 18 countries ranged from Cambodia, the worst performing on this metric, which had a score of 41.4 and a ranking of 121 to Singapore which was given a score of 72.5 and ranked No. 4 among the 130 nations. Some lower-middle income economies did well on this metric, illumining their commitment to advanced education,

4.2. Regulatory Governance in General Provides an Indicator of Data Governance

We next examined each nation's regulatory governance using a perception metric from the World Bank. Perception metrics are based on expert surveys of a country's conditions. Analysts ask these experts a wide range of questions and then aggregate the answers into one numerical assessment. The Regulatory Governance Score measures the inclusiveness of regulatory rulemaking processes and how policymakers interact with stakeholders when shaping regulations. The score ranges from 0 (worst performance) to 5 (best performance) and considers: (i) publication of forward regulatory plans, (ii) consultation on proposed regulations, (iii) report back on the results of the consultation process, (iv) regulatory impact assessments, and (v) whether laws are made publicly accessible. The score reflects an understanding that good governance is not just about making regulations transparent but ensuring that the public can comment on regulations and that the government responds to public concerns about regulations. Governments that have such a give and take between policymakers and their constituents are better positioned to respond to economic and technological changes. Such states have higher levels of trust and compliance (Lindstedt and Naurin: 2010; World Bank: ND, 3). On this metric, richer countries in general scored better than less wealthy countries, but there were some outliers. High income Brunei scored much worse than less wealthy Laos. The best performers were Japan, Korea, and Hong Kong. Interestingly, the fully democratic states did not perform better on this metric than several flawed democratic states.

4.3. Statistical Capacity as a Metric of Producing quality Data

We then utilized another World Bank perception-based metric relating to Statistical Capacity. This score assesses the capacity of a country's statistical system. The data set was limited to middle income, emerging and developing countries and consequently we could not compare Asian countries to those in Europe and North America. Countries are scored against 25 criteria in three categories: methodology, source data, and periodicity. The overall Statistical Capacity Indicator represents the average score within the categories. If a government cannot collect, analyze and present public statistical data, it is unlikely to succeed in AI.

Many nations in Asia do not have transparent and accountable rules for the governance of data gathered or held by governments, whether census data or even scientific data. Chinese, Indonesian and Vietnamese officials seem to view public data as a strategic resource whose use the

government should control (Network Asia Staff: 2016; Hong: 2017 and Girot: 2018, 6). In recent years, policymakers in a wide range of countries have learned how to map their data assets and how to manage them efficiently (Eaves and McGuire: 2019; and Verhulst and Young: 2017). Research has shown that data collected by government can have important spillover effects if it is verifiable and easy to utilize (e.g. in machine readable format). Public statistics can improve governance and reduce corruption, empower citizens by informing them, foster innovation and promote economic growth. Policymakers and researchers can also use these public datasets to solve governance problems.[18] For these reasons, we believe that statistical capacity is a leading indicator of quality of data governance and the ability to produce verifiable public data.

Our 18 countries had significant variance in their statistical capacity. Skill in this area did not directly correlate with regime type or global human capital. Some authoritarian states such as Cambodia scored relatively low (63.3), while Vietnam another authoritarian state, scored relatively well (-83.3) and Thailand, a hybrid regime scored a 90. Some of these same states performed poorly on the next metric, open data.

4.4. Open Data Index as a Metric for Using Public Data to Feed AI

We then utilized the Open Data Index Score, which refers to the percentage of government data sets that are fully open, free and in open file formats (which makes them easy to use for AI systems). The "Open Score" refers to the percentage of datasets that are fully open. This includes datasets relating to: government budget, national statistics, procurement, national laws, administrative bodies, draft legislation, air quality data, national maps, weather forecast, company register, election results, locations, water quality, government records, land ownership data etc. The "Overall Score" is weighted using specific survey questions relating to whether the data is: available without having to register, free of charge, downloadable at once, up-to-date, openly licensed/in public domain, and in open file formats. AI sectors and data analytics sectors are likely to thrive in countries where there is a large supply of open, verifiable high-quality data.

Richer regimes were more likely to score higher then lower middle-income economies. Not surprisingly, authoritarian regimes were less likely to do well on this metric of open data. The two full democracies, Australia and New Zealand, performed the best. We lacked data for several authoritarian regimes such as Laos and flawed democracies such as Mongolia, but Thailand (a hybrid regime) and the Philippines (a flawed democracy) received relatively low scores.

4.5. National AI Plan or Strategy

In Table 1, we also examined whether the 18 states had established an AI plan and online data protection regulations. In 2018, some 25 countries worldwide had published such a strategy or plan (Dutton: 2018).

Analysts argue that having an AI plan can help a country catalyze public, private and academic efforts, and stimulate economic growth and public support. With such a plan, policymakers in democratic states can reassure their publics that they are addressing important questions such as "how can workers and society benefit from the use of AI?" and "will AI be implemented ethically and without bias?" (Delaney: 2018; New: 2018). However, as noted above, an AI plan or strategy is no guarantee of success in AI (Jacobson: 2018).

[18] Open Data's Impact, http://odimpact.org/

Of our sample, only 7 countries have a national plan to develop AI, including none of the lower-income Asian nations, Malaysia and China in the upper middle-income group, and five of the seven high income economies (Zwetsloot, Toner and Ding: 2018).

Of all Asian countries, China is not only the most competitive in AI, but the government has made AI central to its technological and social development. China has many advantages including its large population which can provide a huge amount of data, its wide range of industries seeking to use AI, and its large numbers of researchers and engineers with AI expertise and relatively low level of data regulation (Barton et al: 2017). However, China does not have a data-friendly ecosystem with unified standards and cross-platform sharing. It also has little public sector data that researchers can utilize. China does not allow the free flow of data across borders—it often censors and filters data, arguing it must do so to preserve social stability and national security. Some observers warn that China (and other authoritarian regimes) could stifle its competitiveness in AI with its failure to build an open system of data-governance that is integrated into the global market (Barton et al: 2017 and Aaronson and LeBlond: 2018).

4.6. National laws to protect personal data

Asian nations have a diversity of rules governing data personal data protection as well as data transfer). Table 1 shows that of the Asia sample states, five countries have no personal data protection laws and regulations, while thirteen did have such laws. All these states without such laws are lower middle-income economies, which shows that rising income may correlate with a greater public demand for personal data protection.

Some Asian nations were early leaders in establishing rules to protect personal data. Since the 1990s, the governments of Australia, Hong Kong SAR, Japan, New Zealand, Chinese Taipei, and South Korea have had online data protection rules. Indonesia, Malaysia, the Philippines, and Singapore have recently passed new laws while India and Thailand are considering such rules. However, many of these countries do not have comprehensive provisions regulating the transfer of personal data outside of their borders (Girot: 2018, 3, 118).

Several Asian nations are opting for an approach like the GDPR. Thailand, India, Indonesia, and Hong Kong were greatly influenced by the notion that individuals have a right to move their data (data portability) and/or the right to be forgotten, a right in which individuals can ask that certain links to be delisted online within these countries) (Girot: 2018, 4). The popularity of these concepts in Asia may reflect the attractiveness of the EU approach, public demands for strong data protection, and/or the fact that so many Asian nations are negotiating or have negotiated agreements with the EU. As of December 2018, the EU-Japan EPA goes into effect on February 1, 2019; EU-Singapore FTA is under review by the European Parliament; and EU-Vietnam FTA is under review by the European Council. Meanwhile, the EU is negotiating with Indonesia, Australia, New Zealand while previous negotiations with Malaysia, Thailand, Philippines, Myanmar and India are on hold (European Commission: 2018, pp. 1-5).

Many countries negotiating with the EU are trying to become adequate. South Korea has an FTA with the EU and is working to become adequate, although the agreement does not include language

on cross-border data flows.[19] India is also striving to be adequate (Girot: 2018:118). New Zealand and Japan are considered adequate. [20]

In contrast with other countries, China does not have a single government authority responsible for personal data protection. Yet Chinese citizens increasingly say they want stronger data protections (Sacks: 2018a). Chinese citizens have experienced many data breaches in recent years that exposed personal data such as resumes. Some 19% of Chinese citizens reported that their information was stolen in 2017 (CCNIC: 2018; BBC: 2019). Reflecting the import of data sovereignty to the government, China has introduced personal information protection requirements into its Cybersecurity Laws and regulation. The cybersecurity law puts extra onus on 'critical information infrastructure operators' to store personal information and important data collected and generated within the territory of the PRC. The government is likely to consider firms that operate networks such as public communication, information service, energy, finance, and public services as critical. As of this writing, the regulations are still being discussed (Xia: 2018). China also issued a Personal Information Security Specification that took effect in May 2018. According to researcher Samm Sacks, this regulation also resembles GDPR, although it does not have the same approach to consent. Sacks also noted that the government deliberately designed the language to facilitate AI and access to large data sets (Sacks: 2018). It is important to again note that access to large data sets does not mean the data is of good quality or veracity (Webster and Kim: 2018).

5. Comparative Analysis, using Averages

Table 2 below is an attempt to compare these 18 countries to the US, Canada, and an average of European countries. We chose to compare them to the US, Canada and the EU given those countries leadership of AI. In general, the high-income countries in Asia scored better than the EU average, although significantly less well than the US or Canada. Nonetheless, this comparative analysis suggests that on average, the wealthiest Asian countries are relatively well positioned to govern data and encourage AI.

<Table 2 here>

6. Conclusion

On one hand, Asian countries such as Australia, New Zealand, Singapore, Japan, and Korea are in a good position to adopt, fund, and benefit from AI. These nations already have the expertise, good governance, and data governance skills to address many of the issues related to the data underpinning AI.

Meanwhile, China has benefited from its engineering capacity, government support and alliances with AI sectors, and its huge domestic supply of data to fuel AI (Huang and Scott: 2018). Chinese

[19] http://ec.europa.eu/trade/policy/countries-and-regions/countries/south-korea/; the text of the agreement is at https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:22011A0514(01)

[20] The European Commission has recognized Andorra, Argentina, Canada (commercial organizations), Faroe Islands, Guernsey, Israel, Isle of Man, Jersey, New Zealand, Switzerland, Uruguay and the United States of America (limited to the Privacy Shield framework) as providing adequate protection. European Commission, 2019, "Adequacy of the protection of personal data in non-EU countries," https://ec.europa.eu/info/law/law-topic/data-protection/data-transfers-outside-eu/adequacy-protection-personal-data-non-eu-countries_en

researchers are among the most prolific and Chinese companies and citizens are early adapters of many AI systems. However, the veracity, quality and homogeneity of Chinese data may not yield comparative advantage over the long term. Chinese data is notoriously unreliable. Moreover, as China's citizens demand stronger data protections, the government is likely to respond. New regulation may make China a less attractive venue for AI research and experimentation (Sachs: 2018; Aaronson and LeBlond: 2018)

On the other hand, many Asian countries are not yet well-positioned to govern data and to create and even benefit from a data driven economy. They lack capacity, good regulatory governance and good data governance. Specifically, these states do not have effective personal data protection rules or open machine-readable public data sets.

Herein I have stressed that governments will not be able to advance AI without providing clear rules ensuring access to high quality, accurate and machine-readable public data. But quite a few Asian regimes are authoritarian, hybrid regimes or flawed democracies, and such regimes tend to hoard or restrict access to public data. Such regimes may rely on AI that helps them control or influence their citizens, so they can to retain power (Council on Foreign Relations: 2018). Government reliance and investment in AI could give these states a comparative advantage. However, over the long term, these countries are unlikely to be innovators in the development of AI if they are unwilling to open, share and effectively govern data. Success in AI is not just about venture capital, the supply of researchers, and the supply of data. It is also about effective domestic and cross-border data governance.

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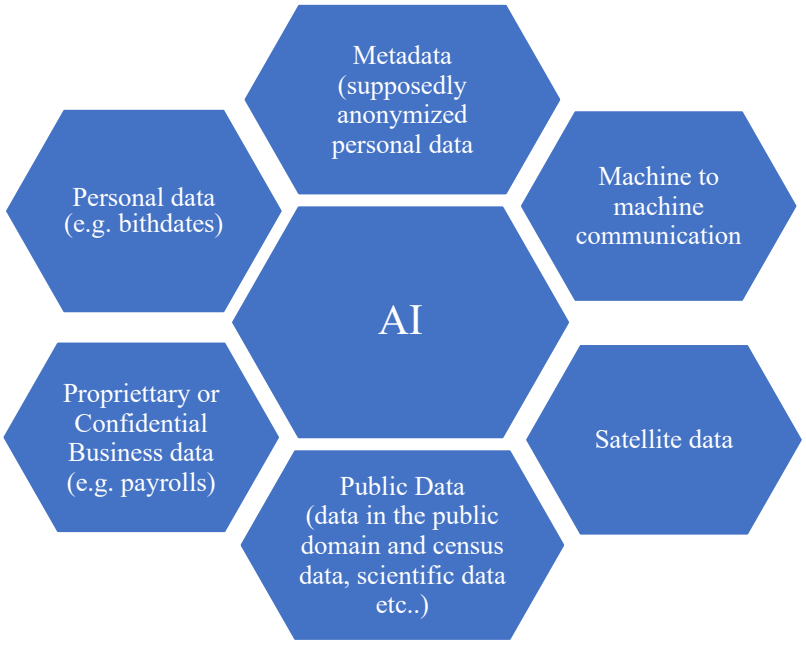
Figure 1: Sources of Data



Source: Aaronson: 2018

Table 1 Metrics of Ability to Create a Data-Driven Economy: Asian States

Group [i]	Country (Categorization)	Score of Know-How Subindex [ii]	Regulatory Governance Score [iii]	Score of Statistical Capacity Indicator [iv]	Global Open Data Index Score [v]	Does the Country Have an AI Plan by the end of 2018? [vi]	Does the Country have online Data Protection Laws and Regulations by the end of 2018? [vii, viii]
High-Income Asian Economies ($12,056 or more)	Australia (Full Democracy)	Score: 61.4 Rank: 29	3.8	No Data	Score: 79 Rank: 2	Australian Technology and Science Growth Plan (May 2018)	Privacy Act (1988)
	Brunei Darussalam (No data)	Score: 58.3 Rank: 40	1.0	No Data	No Data	No Plan	No Legislation
	Hong Kong SAR, China (Flawed Democracy)	No Data	5.0	No Data	Score: 51 Rank: 24	No Plan	Hong Kong Personal Data (Privacy) Ordinance (2012)
	Japan (Flawed Democracy)	Score: 67.0 Rank: 19	5.0	No Data	Score: 61 Rank: 16	Artificial Intelligence Technology Strategy (March 2017)	Act on the Protection of Personal Information (2003)
	Korea, Rep. (Flawed Democracy)	Score: 62.9 Rank: 25	5.0	No Data	No Data	Artificial Intelligence R&D Strategy (May 2018)	Personal Information Act (2011)

Group [i]	Country (Categorization)	Score of Know-How Subindex [ii]	Regulatory Governance Score [iii]	Score of Statistical Capacity Indicator [iv]	Global Open Data Index Score [v]	Does the Country Have an AI Plan by the end of 2018? [vi]	Does the Country have online Data Protection Laws and Regulations by the end of 2018? [vii, viii]
	New Zealand (Full Democracy)	Score: 64.5 Rank: 22	4.3	No Data	Score: 68 Rank: 8	Government is exploring the development of an AI action plan (as of May 2017)	Privacy Act (1993)
	Singapore (Flawed Democracy)	Score: 72.5 Rank: 4	3.5	No Data	Score: 60 Rank: 17	AI Singapore (May 2017)	Personal Data Protection Act (2012)
Upper-Middle Income Asian Economies ($3,896 - $12,055)	China (Authoritarian)	Score: 58.0 Rank: 44	1.8	78.9	No Data	A Next Generation Artificial Intelligence Development Plan (July 2017)	The Decision of the Standing Committee of the National People's Congress on Strengthening the Network Information Protection (2012)
	Malaysia (Flawed Democracy)	Score: 62.0 Rank: 28	4.3	81.1	Score: 10 Rank: 87	MDEC National framework for AI (October 2017)	Personal Data Protection Act (2010)
	Thailand (Hybrid)	Score: 54.3 Rank: 51	4.5	90.0	Score: 34 Rank: 51	No Plan	Personal Data Protection Bill (2011)

Group [i]	Country (Categorization)	Score of Know-How Subindex [ii]	Regulatory Governance Score [iii]	Score of Statistical Capacity Indicator [iv]	Global Open Data Index Score [v]	Does the Country Have an AI Plan by the end of 2018? [vi]	Does the Country have online Data Protection Laws and Regulations by the end of 2018? [vii, viii]
Lower-Middle Income Asian Economies ($996 - $3,895)	Cambodia (Authoritarian)	Score: 41.4 Rank: 121	1.8	63.3	Score: 17 Rank: 74	No Plan	No Legislation
	Indonesia (Flawed Democracy)	Score: 50.2 Rank: 80	3.3	86.7	Score: 25 Rank: 61	No Plan	Law of the Republic of Indonesia No.11 concerning Electronic Information and Transactions (2008)
	Lao PDR (Authoritarian)	Score: 45.1 Rank: 105	3.0	67.8	No Data	No Plan	No Legislation
	Mongolia (Flawed Democracy)	Score: 43.2 Rank: 111	3.8	78.9	No Data	No Plan	No Legislation
	Myanmar (Authoritarian)	Score: 46.4 Rank: 97	2.0	64.4	Score: 1 Rank: 94	No Plan	No Legislation
	Philippines (Flawed Democracy)	Score: 53.3 Rank: 60	2.8	82.2	Score: 30 Rank: 53	No Plan	Data Privacy Act (2012)
	Timor-Leste (Flawed Democracy)	No Data	2.3	64.4	No Data	No Plan	No Legislation

Group [i]	Country (Categorization)	Score of Know-How Subindex [ii]	Regulatory Governance Score [iii]	Score of Statistical Capacity Indicator [iv]	Global Open Data Index Score [v]	Does the Country Have an AI Plan by the end of 2018? [vi]	Does the Country have online Data Protection Laws and Regulations by the end of 2018? [vii, viii]
	Vietnam (Authoritarian)	Score: 41.8 Rank: 120	2.8	83.3	No Data	No Plan	Law on Protection of Consumers' Rights (2010)

Source:

i. World Bank Country and Lending Groups. Available at: https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups
ii. Global Human Capital Report: Know-How Sub index 2017. Value range: 0 (worst performance) -5 (best performance). Available at: http://www3.weforum.org/docs/WEF_Global_Human_Capital_Report_2017.pdf
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v. Global Open Data Index Score 2017. Available at: https://index.okfn.org/
vi. Tim Dutton (2018). Building an AI World: Report on National and Regional AI Strategies. CIFAR. Source: https://www.cifar.ca/docs/default-source/ai-society/buildinganaiworld_eng.pdf?sfvrsn=fb18d129_4
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viii. Clarisse Girot, "Regulation of Cross-border Transfers of Personal Data in Asia," Asian Business Law Institute, 2018. Available at: https://cis-india.org/internet-governance/files/dp-compendium

Table 2 Ability to Create a Data-Driven Economy: Comparison

	Average Score of Know-How Subindex	Average Regulatory Governance Score	Average Statistical Capacity Indicator Score	Global Open Data Index Score, Average
High-Income Asian Economies	64.4	3.9	No Data	64.0%
Upper-Middle Income Asian Economies	58.1	3.5	83.3	22.0%
Lower-Middle Income Asian Economies	45.9	2.7	73.9	18.0%
The US	69.0	5.0	No Data	65.0%
The EU	64.2	4.2	79.3	53.4%
Canada	65.9	5.0	No Data	69.0%

Source: The Author.