Comisión Nacional de Productividad

Disruptive Technologies:

Regulation of Digital Platforms

Economics and Digital Platforms

Abstract

This chapter presents central aspects of the digital economy, particularly platforms. Requirements for the development of the digital economy and some of its future implications are discussed. A general analysis of the digital infrastructure and institutions available in Chile is made, and recommendations are provided.

1.1 Introduction

The telecommunications revolution has generated a new wave of innovation. Technology moves in waves because innovation in different areas makes several technologies profitable simultaneously, partly because they mature together, partly because they nurture each other (Kondratiev, 1925; Schumpeter, 1942). The technological revolution regarding steam motors (1780-1840), the railways and mass production revolution (1840-1890), the electrical revolution (1890-1940), the electronics and microprocessors revolution (1940-1980), and the current telecommunications revolution (which began in 1980), have generated a mass of discoveries, innovations and technological applications. They have simultaneously modified society and the market, and production and relationship manners, and with it, the State´s role and regulation.

Thus, advances in telecommunications and information technologies, including electronic devices, network coverage and geo-referencing, financial progresses in means of payment, and advances in electronic commerce, have generated a wave of innovations in the last decade, marked by the deployment and incorporation of digital technology. Only in Latin America and the Caribbean, Internet users have doubled in a 12-year period (54.4% penetration in 2015[1]). Digitalization has led to the detachment of the physical or material form in the production, provision and marketing of goods and services (Eaves, 2017). For example, newspapers and television, music, digital books and advertising, accommodation and transport platforms, social networks, banking, etc.

There are two types of growth linked to the advancement of technology. In the first type, leaders innovate in new technologies relocating the established knowledge frontiers, and entrepreneurial companies find commercial uses for such advances. Examples of this are early 19th century England, Germany and the United States in the late 19th century, the United States throughout the 20th and 21st centuries. In the second, those who adopt such innovations in their economy and close the technology gap with the leaders will advance even faster than the innovators themselves. Examples of this are Japan, South Korea, and more recently China. Thus, part of the growth of developing countries depends on the speed of technology diffusion. The absorption capacity in these countries is as vital as the innovation capacity of leaders. The information technologies revolution is no different, having already spread the use of technology (for example, Chile has the best numbers of access and penetration of Internet in the region). The following stage is the dissemination of its productive and commercial uses. A fundamental part of this diffusion process that

[1] In addition to efficiency, digitization allows us to improve the consumer service, allowing not only competition for costs but also for differentiation.

closes the gaps - and therefore its impact on productivity, growth, and well-being - is the regulation that normalizes the use of new technologies in the countries that adopt them

Dematerialization has enabled the needs of organizations and individuals to be met more effectively, efficiently, and quickly while forcing traditional suppliers and their workers to upgrade. Individuals feel the pressure to adapt and acquire new skills as companies face increased competition and higher expectations of their customers.

At the same time, this has implied a change that affects governments in at least two dimensions. First, the general regulations (for example, labor or tax) and the sectoral regulations (for example, in banking or the media) are stressed by the new forms of production, relations, and commercialization, which occasionally enter into grey areas regarding regulations in force, or even into explicit contradiction. Thus, technology regulation has become a major global challenge, from which Chile is not exempt. Second, even in the spaces where the regulations are applicable, the digital explosion, pushing to a limit their capacity to control nascent sectors and their new agents, has overwhelmed the government and its agencies. To remain relevant, audit bodies need to understand and, in many cases, adopt the same technological advances as the companies they are to audit. Thus, regulatory technology has become another major global challenge, one that seeks to increase the effectiveness and efficiency of regulators by making use of technological advances.

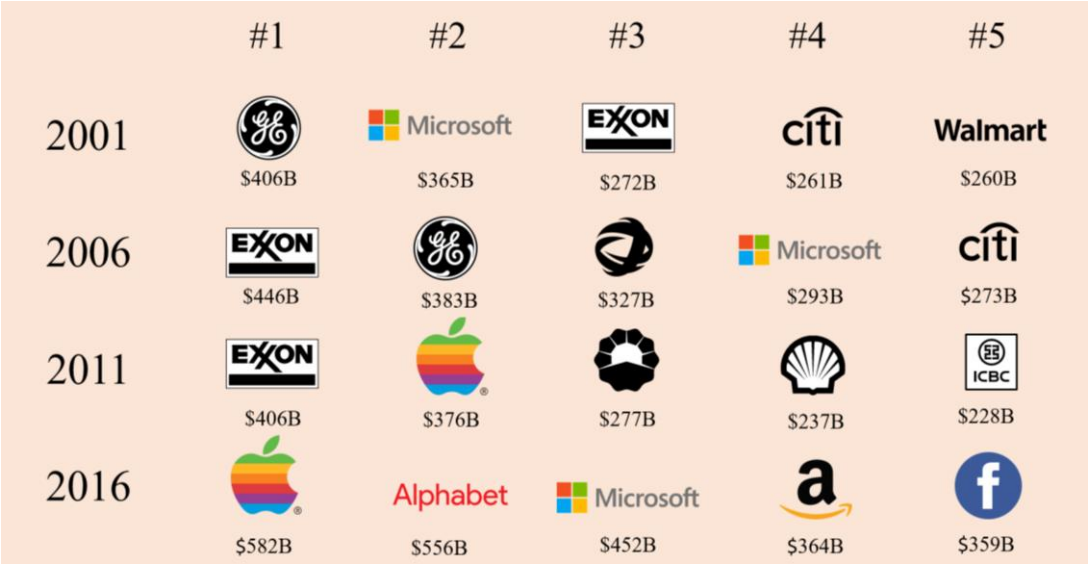
These two aspects will be discussed in this report. In this chapter, we introduce issues related to digital platforms, and the challenges they pose to infrastructure and governance in their massification.

1.2 From Physical Space to Virtual Space, Disruption

1.2.1 The digital economy

The emergence of digital technologies is evident when studying companies with the largest stock market capitalization worldwide. In 15 years, companies in the digital economy have displaced traditional companies (see Figure 1.1).

Figure 1.1. Companies with the largest market capitalization (in trillions of dollars).



Source: National Productivity Commission. Note: Companies of the digital economy are in color.

The term "digital economy" coined by Tapscott in 1994 referred to how Internet-based digital technology would change the way we interact in the economic arena. Today, the concept encompasses a majority and growing set of markets and exchange spaces that make intensive use of new digital technologies. They extend throughout the entire economic system including production, distribution, trade, and consumption of goods and services. In this space, feelings and experiences are also exchanged, not always with financial objectives.

Digitization does not make machines expendable but empowers them by adding a digital component that makes them programmable (for example, software can be updated and instructions can be added that modify the machine without disassembling it). They are also autonomous (for example, they are provided with "artificial" intelligence), and can be interconnected (for example, facilitating remote operation and monitoring, and giving way to the so-called "Internet of things"). Thus, the digital economy includes equipment (e.g., antennas, fiber optics, machines, robots and sensors), algorithms (e.g., those that control the machine's artificial intelligence), and techniques (e.g., marketing or financial) that together have the potential to revolutionize all areas of society, including economically, and in all sectors.

Finding 1.1: The digital economy is part of a technological revolution that affects the way society produces and relates, posing challenges for workers, businesses, and governments.

1.2.2 Impacts

The most relevant impact of digitization is an increase in efficiency that allows a significant reduction in costs in all sectors where it is applied. [2] On the one hand, the reduction in transaction costs -necessary to carry out an exchange, but challenging to reduce by one of the parties- stands out, the main one being information asymmetries (see Box 1.1). On the other hand, as a marketing channel, digitalization offers a considerable reduction in search costs (to the consumer), reduces or eliminates intermediaries (to the supplier), and facilitates the connection between producer and consumer. At the same time, marginal production and distribution costs are reduced, reducing unwanted downtime or physical assets with capacity gaps.

Box 1.1. Information asymmetries

Whenever one of the participants in an exchange has more information than the others, two types of risks arise adverse selection and moral hazard. If the magnitude of both risks is significant, they can inhibit trade and diminish the existence of a market.

Adverse selection occurs when one party cannot distinguish, prior to the exchange, a relevant attribute from the other because the character is not observable (e.g., quality). Used cars are a typical example, where the buyer cannot check the quality of the product before buying it and is therefore willing to pay the average price for the expected quality. This situation encourages the exit of used cars that are above average because sellers know the real worth of their vehicle (Akerlof, 1970). Therefore, this causes the average price to fall, which eventually could make the market disappear. One solution is to credibly indicate the attribute information, for example, with an authorized technician's report on the vehicle's condition.

Moral hazard is present when some of the attributes on which the transaction was made are modified after the operation. The classic example is insurance because the insured can assume more risks knowing that they have coverage, and it is expensive for the insurer to monitor. Some solutions are to request collateral or include incentives in the contract.

Digital intermediaries, such as platforms, reduce information asymmetries. They allow precision in the search, compel the agents to signal, or include incentives in their contracts that minimize the possibility of opportunistic behavior. For example, classifications of users and providers seek to reduce asymmetry.

Source: National Productivity Commission

[2] International Telecommunication Union (ITU), World Telecommunications / ICT Indicators database (2016).

Efficiency gains are achieved through the creation of digital goods and services (e.g., through the development of production, distribution, exchange and consumption platforms), and the addition of value by incorporating digitalization into traditional goods and services. This efficiency based on information technology generates opportunities for new entrepreneurs and strong disruptions in established markets. By disruption, we refer to the effects produced in the markets due to the application of technology, even though the technology itself is not disruptive. Thus, the implementation of an algorithm that allocates cars to individuals for a trip may not be disruptive, but its application is disruptive in the transportation market.

The disruptive impact is notorious in several respects, some of which we mention below.

Competition: competing effects determine the impact on competition. On the one hand, a more significant number of suppliers, lower entry barriers for companies or entrepreneurs, and lower costs increase competition. On the other hand, digitization generates a comparative advantage due to network effects, where there are efficiency gains for the most substantial number of users, which, in turn, become barriers to entry for new providers in the digital environment. Reinforcing this last point, the control of information generates greater market concentration, either in the case of intermediary platforms or those that offer services directly. Finally, existing competition regulation may not be able to be implemented initially in these digital companies, leading to periods of unfair competition.

Trust: Platforms allow for improved trust between stakeholders, thus reducing information asymmetries on both sides. The existence of online reputation mechanisms, which encourage the appropriate behavior of the parties (e.g., suppliers offering quality and consumers complying with payments) makes this possible, allowing unknown people from opposite poles of the world, who will indeed not have any other transaction in the future, to trust and exchange assets (tangible and intangible) through the platforms. In fact, according to Mazzela (2013), "trust has gone from being a scarce resource to an abundant one" in the digital domain. However, there are still risks associated with the anonymity that platforms allow, which can lead to exploitation and the fact that online reputation (personal or organizational) is created and destroyed more quickly and massively than its offline version, which can lead to greater instability.

Information: Digitization facilitates large-scale, real-time data collection and analysis, enabling rapid and flexible learning that itters and improves according to feedback from within the digital world. Technology makes it easier to obtain new and more complex data, which is transformed into accurate information, and in turn enables new products, services, and business models to be improved or created that are more in line with the needs and desires of consumers. In the public sphere, better information also allows for better oversight and regulation based on measurable criteria. Nonetheless, the above also poses challenges, especially concerning security, privacy and the use of personal data.

Employment: Technology makes it possible to distribute the workforce more efficiently and make better use of assets. In some cases, technologies complement workers, while in others they replace them. However, in both cases, they require new skills and competencies that pose challenges in the training of future professionals. The programming languages, the numerical capacity and others related to digitalization are

becoming more and more critical, which is not yet reflected in the Chilean educational networks. The risk of a reduction in demand for specific jobs is real, in some cases by replacing workers with machines, in others, by greater efficiency. The potential for job creation is also real, but to achieve it, enabling actions are needed in the area of training and labor regulation. Regulatory challenges are generated concerning labor regulation, due to the validity of its disciplines, the capacity for supervision and how to adapt labor rights in virtual environments.

Equity: Technology has effects on the distribution of opportunities and income. Participation in virtual markets-and in the digital economy-requires education, access to technology, and the availability of electronic means of payment. Those who participate can offer their services through the digital world, with fewer possibilities associated with discrimination based on appearance, socioeconomic background, or gender (Graham et al., 2017). For platforms to be used as a commercial channel, it is necessary to make goods or services, or assets available. Thus, renting accommodation or using a vehicle for passenger transport implies a certain level of access to capital, which is not distributed evenly in Chile. If access to technology is restricted, or the use of platforms is limited to the provision of capital services rather than labor, the effect may be adverse regarding income equity.

Government: Digitization presents opportunities and challenges for the State's public agencies and their interaction with the environment, achievable through better risk assessment in regulatory activities, the integration of digital services, the digitization of information and procedures, and better management of the available infrastructure. It deepens democracy, improves governance, and increases transparency. The challenges are enormous, and this report will describe them, but the primary challenge is for regulators and public policymakers to understand and learn from the impact of digital technologies on the economy and society (Eaves, 2017), and to deploy the State's regulatory capacity based on this knowledge.

Finding 1.2: Digitization affects multiple economic and social dimensions including competition, trust, work organization, data generation, transparency, and the role of regulatory agencies (oversight and supervision).

1.3 Digital Platforms and "networked effects

Much of the digital economy is based on digital platforms, tools that provide a technological interface that connects agents in virtual markets, facilitating interaction between participants. The former appeared in the mid-1990s, such as eBay or Amazon, selling second-hand goods and items, traditionally sold by catalog or in established stores, and have increased in the last decade spreading to the world of services, notably financial services, transportation, education, medicine, and others. Its massification is due to the ubiquity of smartphones, internet access, the expansion of payment methods, and the creation of online trust and reputation mechanisms.

Platforms can directly offer services or improve the integration between bidders and demanders, for thanks to efficient search mechanisms (algorithms) that precisely connect stakeholders, "matching" between agents can be more precise. Platforms also add value by integrating payment and distribution services, which reduce the risks involved in the

transaction; and reputation mechanisms that reduce information asymmetries. Thus, the platforms not only perfect existing markets, but they also create new markets.

A key feature of digital platforms is the existence of "networked effects," the positive externality associated with network size, whereby the more "bidding users" and "claimant users" operate the platform, the more efficient the algorithms become, the faster the reputation is built, and the more transactions arise. “Networked effects" are the result of having more users connected, each user has access to a larger network, which deepens competition. Platforms seek to charge an optimal fee to each user (bidder or claimant) so that intermediation is profitable, although as in any market it will depend on the relative elasticity of user demands on each side. “Networked effects," by improving the process of integration and meeting between the players, also makes tariff sensitivity more inelastic, so that the party most interested in the service can partially or wholly subsidize the other party. For example, some media do not charge their readers, but they do charge those who want to place ads. Search engines such as Google allow free access to information, but they do market the consumer preferences to improve the marketing process of their providers.

The encouragement to grow the network to benefit from the effects of economies of scale creates risks of monopolization. The more "networked effects," the more users prefer to use the platform, but the economy of scale is trying to achieve for new platforms, raising the cost of entry and making the virtual marketplace unchallenging. In other words, it facilitates the concentration of market power on a platform, which can dominate an industry when it reaches a critical mass relative to its competitors (Google and Amazon are good examples of this effect). With this in mind, platforms can incur accounting losses while consolidating the critical mass that delivers them networked effects. [3]

1.3.1 Taxonomy of Digital Platforms

Types of platforms

There are multiple digital platforms. They vary according to the kind of service offered, the business model, and the industry where it competes, among others. [4]

A first distinction is according to the type of good or service that is being intermediated. Digital platforms such as Google (search service), WhatsApp and Skype (communications services), Facebook and Linkedin (social networking services), YouTube and Instagram (content creation and dissemination services), etc. simplifies an integral part of our daily lives. Some of these categories overlap, being Facebook a platform to create content and Instagram a social network, but also being both used as communication platforms since they have integrated messaging services.

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[3] For example, the Spotify platform closed in 2016 with a negative income of around 600 million dollars. In 2017, it doubled the losses, although revenues increased 50% to US $ 2,930 million.

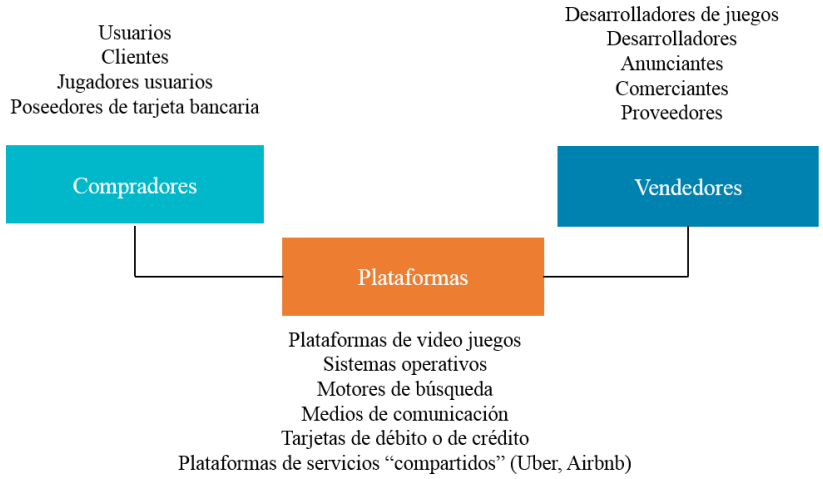
[4] Two-sided platforms have a bi-directional exchange in their business models. The studies by Roche & Tirole (2003, 2006) are the seminal works on this type of platforms. In contrast, a traditional business follows a vertical structure, i.e., a one-way exchange. See Annex - Figure A.1.1.

On the other hand, there are digital product marketing platforms (marketplaces [5]) such as Amazon, Airbnb, eBay, Yapo or Mercadolibre that intermediate goods and services. Moreover, others specialize in brokering services such as Glovo, PedidosYa, etc., sometimes associated with the use of an asset such as a car, in the case of Uber.

Other platforms intermediate transactions between buyers and merchants, such as Visa or MasterCard[6] credit card issuers. Video game consoles such as Nintendo and PlayStation operate as platforms when searching in parallel for buyers and developers. The same goes for operating systems such as Windows and Apple and Google application stores. (See Figure 1.2)

It is important to note that, while digital platforms are intermediaries, the level of intermediation is very variable. Some operate as intermediaries (similar to the newspaper's classified ads), while others have a direct impact on the service provided through the platform (e.g by setting prices and conditions), while others offer ancillary services such as payment and distribution.

Figure 1.2 Examples of two or more side platforms



Source: Tirole (2017)

Vertical integration within platforms

Some platforms go beyond intermediation and opt for vertical integration, which is exceptionally easy as platforms collect valuable and accurate information from their users, such as their preferences and willingness to pay; and the marginal cost of producing a digital good is near zero. For example, Netflix was vertically integrated generating its

[5] In essence, these platforms are not very different from an analog platform (like a bulletin board or a market). The difference lies in the scale and efficiency in information processing.
[6] The higher the number of consumers affiliated with the card, the greater incentive for businesses to join the platform and vice versa.

productions, having previously identified the type of productions most popular among its users. [7]

Integration creates problems in assigning responsibilities because platforms have the power to decide on variables such as openness and compatibility (with other platforms), thus determining their format. Therefore, they can choose not to share the space, for example, if Netflix had exclusively owned productions, or not being compatible in some devices or systems. On the other hand, Netflix currently offers the possibility of downloading movies and series, but only on tablets and cell phones, not on computers. In this way, the lack of interoperability between platforms means that potential network effects are lost, and many users end up entering incompatible platforms (multihoming).

Shared Platforms

Some platforms allow individuals to leverage their unused or underutilized assets (e.g., an apartment or a vehicle) in exchange for a monetary reward, popularly known as the Sharing Economy, whose composition and limits are still blurred [8] (see Box 1.2.).

Figure 1.3 presents a taxonomy adapted to the Codagnone and Martens (2016) proposal,[9] which uses a horizontal dimension (for-profit/non-profit) and a vertical dimension of exchange between individuals or persons and organizations. The quadrants on the left side represent nonprofit peer exchange platforms, where individuals who help other individuals can participate, or through nonprofit organizations and businesses that collaborate with nonprofit projects despite their economic goals. The quadrants on the right side represent trading platforms. The lower right quadrant considers total trade between individuals and companies, while the upper right quadrant refers to "sharing economy" platforms that allow individuals to share/use their assets, time and skills for monetary reward. [10]

Some platforms can be in any of the four quadrants, such as alternative financing, for platforms that apply for funds can be foundations or businesses, and both individuals and

[7] The exciting thing about this example is that once the platform obtains the competitive advantage of the information, it decides to become a supplier and compete with the suppliers that also contract its service to reach the other side of the market (subscribed users).

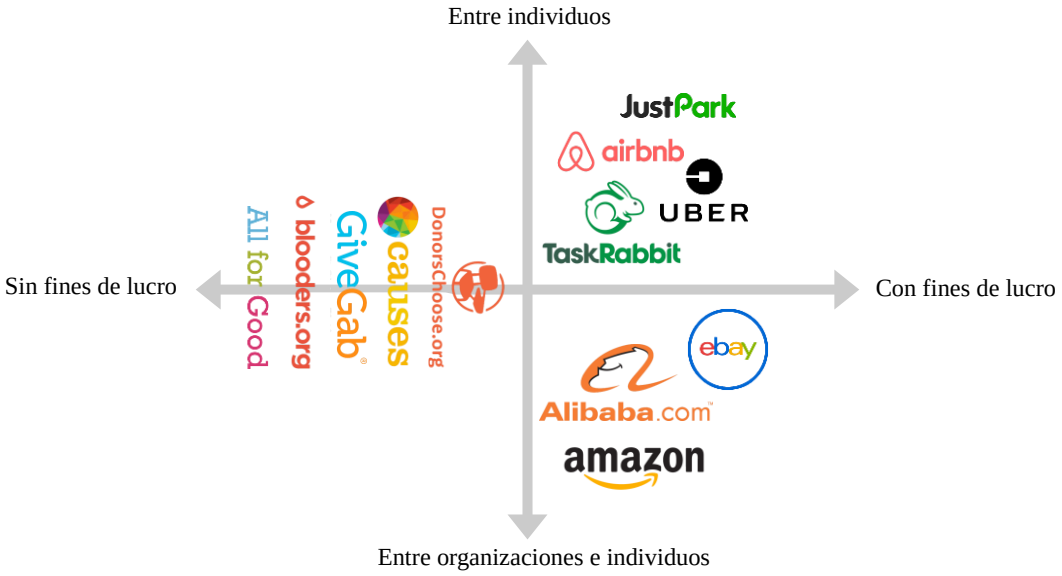
[8] In turn, within the same sharing economy platforms there are several classifications (Sundararajan, 2016). Botsman (2013) classifies sharing economy platforms according to the economic activity it impacts; production, consumption, finance, and education. Along the same lines, Owyang (2016) defines 16 industries, and some sectors within them, in which individuals can create added value through sharing economy digital platforms.

[9] Codagnone and Martens (2016) proposed a taxonomy that classifies platforms according to whether it relates person to person (P2P), or businesses with consumers (B2C); and whether or not it has profit. In this way, a Cartesian plane is generated with four relevant quadrants and the variables in the axes. The first quadrant corresponds to the platforms that connect individuals called person-to-person commercial exchange (commercial P2P "sharing"). In the second quadrant -up and left- are the platforms that connect individuals with non-profit intentions, called sharing (true sharing). The third quadrant corresponds to an empty set related to platforms with a non-commercial relationship between businesses and consumers; because the companies, in themselves, are for profit. Finally, the fourth quadrant is the one that connects businesses and consumers, called B2C commercial exchange (commercial B2C).

[10] This is very similar to the description of Sundararajan (2016) about mass capitalism rather than a hierarchical one, with exchanges mainly for commercial purposes, use of idle capacity and diffuse limits between professionals and peers, and dependent and independent employment.

organizations of any lucrative nature can raise them. Additionally, they are classified according to funding intent (grants, rewards, loans, and equity investments).

Figure 1.3. Platforms' Taxonomy.



Source: Adapted from Codagnone and Martens (2016) and Sundararajan (2016)

For there to be person-to-person (peer-to-peer) platforms with commercial intentions, the value of the asset/experience must be high enough for it to be profitable to lease, i.e., to cover logistics costs, the use must be such that it leaves idle capacity available, and easy to use, so as not to require significant investments in learning and add-ons (Gansky, 2010). The actual platform use must be cost-effective, including the cost associated with the listing, whether imposed by the platform itself or by the authority. The latter are the ones that generate the need for adequate regulation given the massive adoption and disruption in established markets, but especially by the users' categories, who are both consumers and producers, and with a percentage of them being part-time providers, or "peers" rather than "professionals" who are full-time workers.

Finding 1.3: Digital platforms are tools that aggregate bidders and demanders to facilitate exchange by reducing transaction costs (and integrating means of payment).

Finding 1.4: There is no consensus on the definition of Shared Economy. Within these platforms, there are multiple categories, and those oriented towards commercial exchanges are the most relevant concerning global impact.

Box 1.2 Sharing Economy Platforms

The Sharing Economy concept is generally used to describe businesses that allow the exchange of goods or services by connecting organizations and/or people through digital platforms, although they are not necessarily solidarity platforms since many suppliers and almost all platforms expect monetary rewards.

Mainly, the platforms' business models refer to the efficient use of underutilized assets, connecting bidders and demanders, but with important nuances. Assets should have enough cost and disuse for users to prefer borrowing or leasing them, rather than buying or using traditional providers of similar services. Naturally, owners should be willing to capitalize on them. In this sense, cities are a particularly suitable environment for "sharing" economies, since the number of potential participants and the proximity between them is high. They are also more accustomed to sharing infrastructure and lack the space to store unused assets.

The distribution of "sharing" economic activities in a market-to-gift spectrum somehow represents the extent to which the social versus the commercial facilitates exchange. At one extreme, Gift Economies mimic the supportive nature of gifts traditionally given by relatives or close friends (e.g., alternative financing or crowdfunding). At the other end, Market Economies are similar to the traditional rental market (e.g., houses and cars); although they avoid paperwork and costs derived from information asymmetries. Thus, it is profitable for individuals to lend or borrow certain types of assets (e.g., tools), or to lease only a part of them (e.g., seat or room versus car and house), for short periods of time and at a lower cost. In short, leasing is not the same as sharing.

1.4 Chile towards a Digital Economy: Infrastructure and Institutionality

1.4.1 Digital Infrastructure

The viability and existence of the digital economy depend on access to the Internet, and therefore on the governance of the digital infrastructure for network access. This infrastructure (or digital ecosystem) consists of three layers. The first corresponds to passive infrastructure, the physical infrastructure that sustains telecommunications through pipelines, roads, rooftops, towers; in other words, the telecommunications networks transport. [11] In this layer, Chile has a disseminated institutional framework, the State not having an agency that centralizes or coordinates the actions and regulations in each of the facilities.

The second layer corresponds to the active infrastructure, which provides users connectivity and telecommunications services through the passive infrastructure, such as the nodes that allow telephony (mobile and fixed) and the Internet. Unlike the previous layer, its primary purpose is telecommunications. The Undersecretariat of Telecommunications (Subtel), responsible for the application and control of the General Telecommunications Law (LGT), grants licenses, concessions and permits to telecommunications service operators (Art. 3 LGT). The availability of digital infrastructure is taken for granted, but it can be disruptive in the event of an emergency or disaster.

[11] The telecommunications transport network in Chile is composed mainly of three parts. First, a backbone network that is responsible for covering long distances and receive traffic from aggregation networks. Second, aggregation networks distribute the signal within cities and small areas and reach the user through access terminals. Third, access terminals reach individual homes. The backbone network must be able to support different networks of aggregations to allow bidder competition, which implies strengthening it in the face of growing data traffic and monitoring the speed offered in fixed networks.

Finally, the third layer consists of the services that "run" over the two previous layers, called over the top (OTT), which include, for example, digital platforms whose service is provided via the Internet. In spite of the economic and social relevance that OTTs generate, there is no institutional framework in Chile that acknowledges, promotes or sanctions them, partly because they transcend telecommunications (i.e., the transmission and reception of information only), and because they are found in multiple markets and sectors.

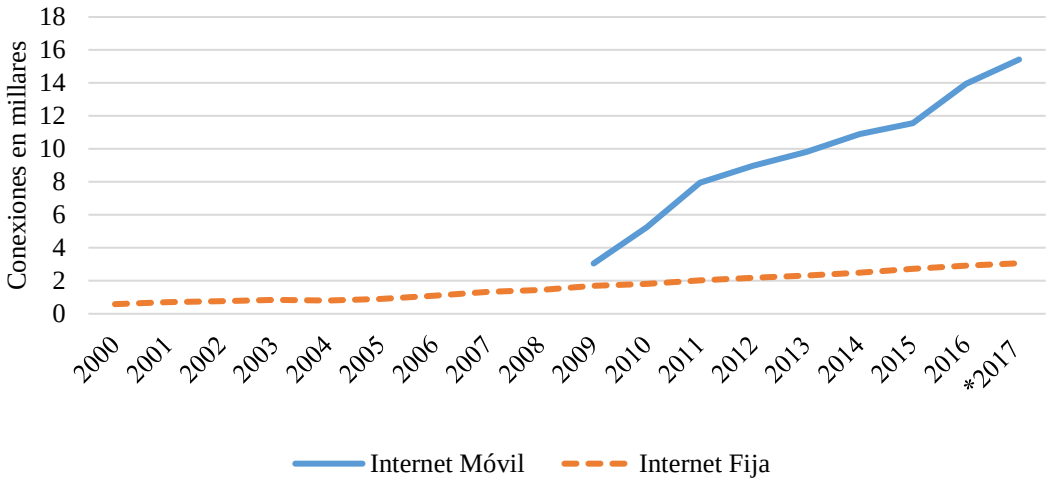
The development of the digital economy in Chile is mainly due to the evolution of the first and second layers, which has allowed Internet access and speed to increase. The Internet evolved using existing networks that provided telephony or cable television services. The Internet is, therefore, a dynamic network where, regardless of the physical or wireless network to which a user is connected, it can always be accessed. Currently, the rapid deployment of the Internet over mobile networks compared to the fixed Internet (see Figure 1.4) stands out, mainly due to the relatively lower installation cost. [12] However, in any case, the fixed network[13] has grown, which stands out for providing a higher service quality (bandwidth). For this reason, it is expected that fixed and mobile networks will complement each other by considering this combination of quality and speed of deployment, marking out a trend towards network and service convergence (all services will be provided over any network).[14]

[12] In return, fixed networks can now provide higher capacity for data transmission than mobile broadband networks.

[13] In Chile there are mainly two types of fixed networks; the old fixed telephony networks, which have been adapted to provide Internet service mainly through DSL technology and cable television networks that have also been adapted to provide Internet services.

[14] In the future, the user will not distinguish what type of network is connected, the network itself will administer this connection depending on the speed with which the user moves and where they are located.

Figure 1.4. Annual Internet connections by type of network 2000-2017.[15]



Source: Compilation based on Subtel. Note: The mobile internet data series begins in 2009.* For the year 2017, the figure corresponds to September 2017.

The speed at which technological change occurs pushes the sector to compete and increase its efficiency, generating ever-greater changes in the mobile internet and partly explaining the low relative growth of fixed internet connections. As shown in Figure 1.5, Chile is in the process of switching from third generation (3G) to fourth-generation (4G) mobile technology: by the end of 2016, 4G already accounted for 45% of all connections, reaching that level in just three years. Likewise, the ubiquity of smartphones explains that 92.5% of mobile internet connections occur through these devices. [16]

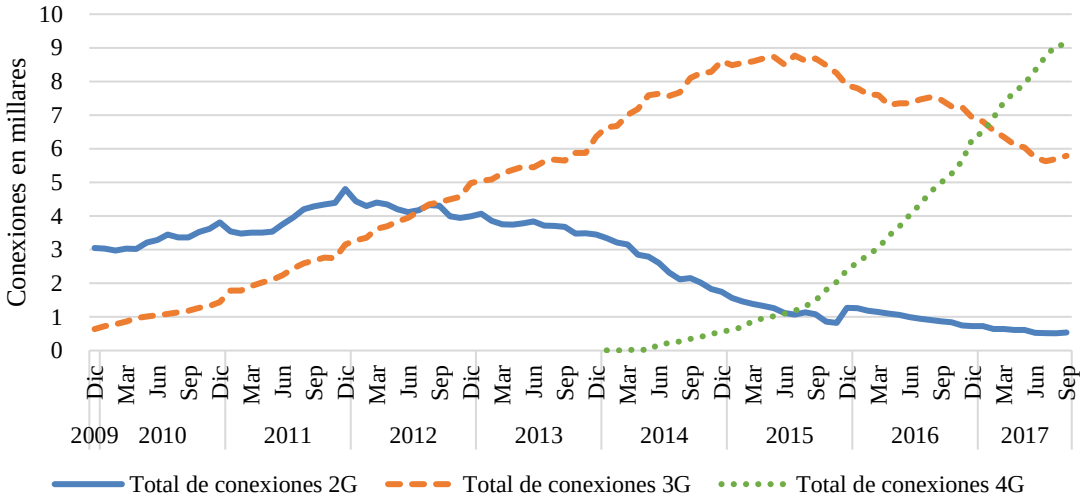
Regarding prices, the OECD distinguishes three types of baskets according to the level of service provision: low, medium and high. Chile ranks below the OECD average in the low basket and above in the medium and high baskets. While it is not possible to have access to precise information on mobile broadband prices in Chile, there is a consensus that they have gone down due to increased competition and some successful public policies such as number portability and the systematic and sustained reduction of "access charges" [17] over time.

Despite the progress made over the last 15 years and Latin American leadership, Chile's digital infrastructure should not be considered ready or complete, as challenges remain concerning coverage (high-speed fixed network), quality and resilience. This is especially relevant since the digital infrastructure is a crucial enabler for the private and public

[15] Mobile connections correspond to the number of different users who have connected to the Internet in a dedicated way in mobile cellular networks within the reporting period. A connection is posted for each client and/or user, regardless of the number of times that the user connects to the Internet within the period to be reported (month).
[16] The rest of the uses of mobile internet correspond to 5.3% BAM (USB) and 2.1% machine to machine.
[17] They correspond to the charge that a telephone company makes to another for terminating a call in its network. Subtel fixes and regulates these values every 5 years. While they are fees related to voice service, a significant proportion of the internet plans on offer in the market include telephone call packages.

sectors' modernization through the incorporation of information technologies into their processes.

Figure 1.5. Mobile internet connections.



Source: Compilation based on Subtel.

Finding 1.5: The digital ecosystem is composed of three layers, passive infrastructure, active infrastructure and services provided by the active and passive infrastructure layers. The development of infrastructure in Chile has laid the foundations for the growth of the digital economy, especially access to mobile devices and the 4G Internet.

1.4.2 Digital Institutionality

In Chile, numerous efforts have been made to create a digital institutional framework capable of regulating the three layers together. However, this objective has not yet been achieved, with the priority still being given to the Agenda institutionalization. Since 1999, five Digital Agendas[18] have been defined, each of which established development strategies and set the work of existing entities (ministries), as well as defining new advisory bodies (commissions). However, some have been very short-lived (for example, the fourth agenda was discontinued after ten months), which makes it challenging to implement and to continue the measures.

As is customary in the country, each government can define a new strategy upon arrival, denoting little continuity in some of the issues, and even less in the authorities, which poses a problem to an institutional framework Agenda, which is highly dependent on the interests of the current minister[19]. Nonetheless, Subtel has promoted a series of laws in

[18]"Chile: Towards the Information Society (2000-2004)", "Digital Agenda brings you closer to the future (2004-2006)", "Digital Strategy 2007-2012", "Imagine Chile (2013-2020), and" Agenda 2020 Chile Digital for all (2015-2020) ".

[19] In addition to the Agendas, at an international level, two other forms of digital institutionality stand out: ministerial or undersecretariat, and agency. The digital institutions of a ministerial or under-secretariat nature have the advantages of having political power and public policy design capacity, but, it is disadvantageously dependent on the political cycle and may be biased towards telecommunications issues

recent years aimed mainly at the consolidation of the first and second layers, such as the Minimum Internet Speed Law [20] (Law 21,046, 2017), the Law of Free Choice of Telecommunications Services [21] (Law 20,808, 2015) and, together with the Ministry of Public Works, the Infrastructure Fund (Law 21,082, 2018).

Within the framework of the fifth and current agenda, "2020 Agenda Digital Chile for Everybody", a new institutional framework was defined, which has its origin in Decree N°1 of the Ministry of the Presidency's General Secretariat (January 15, 2016), which creates the "Committee of Ministers for Digital Development". [22] In this inter-ministerial committee, Segpres prepares and approves the action plan for digital e-government development; [23] the Ministry of Economy prepares and supports the action plan for competitiveness, innovation, and entrepreneurship, [24] and the Ministry of Transport and Telecommunications (MTT) prepares and supports the proposal for connectivity, social development, and digital inclusion.[25]

Within the MTT, the Undersecretariat of Telecommunications[26] is fundamental in fulfilling two relevant functions; i) it promotes telecommunications, dictates the technical standards in the field and grants the various authorizations (concessions, licenses, and permits) to the respective telecommunications service operators according to article 3 of the LGT. The model is based on the State's Subsidiarity principle, whereby the private sector invests in the deployment of networks and the State acts wherever it is not profitable to spend, subsidizing through the Telecommunication Development Fund; [27] ii) it controls the companies, applying the corresponding fines and sanctions in the event of non-compliance with the regulations. This dual role of advocacy and oversight has led to a confusion of roles. To deal with this situation, in 2013 a bill was presented to create the Superintendence of Telecommunications (Bulletin No. 8034-15), which has not made any progress since 2014.

rather than other digital areas (for example, Colombia with the ICT Ministry). On the other hand, the Agency institutionality is independent, and its primary role is the development of public policies on the matter. The advantages of the agency are greater stability given the independence of political power along with a more systemic view of the issue (for example, Uruguay with AGESIC).

[20] It mandates a guaranteed minimum speed of Internet access and regulatory changes in the telecommunications regulation area, and more transparency obligations in companies that offer access to the Internet. It also adds new obligations and higher powers to the Undersecretariat of Telecommunications, to establish guarantees regarding the quality of Internet access service.

[21] The mandate against pipelines stands out whereby every condominium or new construction project forces companies must have the necessary capacity for the telecommunications facilities, so that various telecommunications operators can supply their services under competitive conditions, in accordance to the respective technical regulations.

[22] The primary objective is to advise the President of the Republic in the formulation of the national policy of digital development, as well as in the establishment of guidelines and projects for its implementation.

[23] For example, through the Digital Government Division.

[24] For example, via CORFO and its various promotion instruments.

[25] Compared to international experience, it is striking that the Institutionality of digital development is the Undersecretariat of Ministry of Transport.

[26] Created by Decree Law 1,762, of 1977.

[27] Which tend to be small relative to the investment needs of the sector. Projects such as the Fiber Optic Austral (US $ 100 million) are more an exception than a rule.

In short, in the first layer, there is no coordinating Institutionality. As for the second layer, Subtel promotes and supervises telecommunications operators and, in the third layer, there is no Institutionality either.

Finding 1.6: Digital institutionality in Chile is fragmented and does not strategically nor coordinately. The institutional development process has not been able to continue, and a series of agendas between the different governments have been detected since 2000. Efforts are concentrated on the second layer of telecommunications operators regulated by the Undersecretariat of Telecommunications.

1.4.3 Challenges for the deployment of the Digital Economy in Chile [28]

The permeability and importance of services associated with the digital economy, which involves both public (health, education, procedures) and private sector aspects, depend on the infrastructure development and telecommunications services management to achieve a minimum standard of coverage, quality, and accessibility for most citizens, in line with international benchmarks. This is a consistent digital policy objective across Agendas and governments.

Thus, digital infrastructure and institutions present significant challenges to meet the growing demand for digital services: three of them are partially developed here. The first corresponds to the lack of sufficient infrastructure to support the increase in demand (traffic) in the coming years. The second refers to the digital gap and Internet access as a necessary service for everybody, and the third, to the lack of a clear institutional framework in charge of the digital ecosystem, which requires the definition of explicit entities and/or functions, as well as the modernization of the regulatory structures in the three layers.

The projected growth in demand will be determined fundamentally by the demand in homes, especially concerning video, which will trigger new, more demanding developments as to the speed, capacity, and quality of the network (Subtel, 2017). Modern transport networks are needed, mainly backbone networks, which support high levels of aggregation. The current infrastructure is insufficient in fixed networks (high speed), deficient as to resilience effects, [29] and many fiber optic networks have lost operational guarantee (obsolete). Indeed, if Chile were to traffic the average amount of OECD data today, the transport network would collapse (Subtel, 2018).

Regarding supply, the projections also suggest a collapse, given the increasing consumption by operators, and the constant incentives to renew and build new transport networks. Thus, care must be taken to strengthen the backbone network to support the traffic growth - of higher intensity and aggregation networks- in the coming years.

[28] Based on the review of multiple diagnostic documents of public institutions (Subtel, CORFO, among others), private (Digital Country Foundation, Chilean Association of Information Technology, SOFOFA, among others) and academic.

[29] Since the internet has become a critical infrastructure, it needs to be robust in the face of natural disasters.

Moreover, low resilience must be addressed through promoting supportive public policies[30] and public-private partnerships to improve the reliability of networks.

The debate is open regarding the best way to encourage the renewal of obsolete networks and the construction of new infrastructure. For example, they could be through operators in conjunction with the state or only private efforts. [31] Given that the estimated investment amounts to US$2.635 billion annually over the next ten years (CChC, 2016), it is difficult to think that this can be achieved without a public-private partnership.

Not only is infrastructure lacking, but its growth has also been uneven socioeconomically, between regions, and between rural and urban areas, mainly due to the geography and cost/price structures of providing services. The offer is designed to meet the particular needs of business customers (at a higher price) rather than those with low payment capacity. The above explains the low penetration of fixed networks in rural areas, due to the lack of "transport" or access networks (last mile problem) that would allow companies to offer the service by limiting coverage, quality and capacity. On the other hand, the public policies applied in the sector, through subsidies for infrastructure investments, have not been entirely successful over time due to the rapid technological change inherent in telecommunications, which has rendered obsolete the mandatory services to be provided (in the tenders defined for access to investment subsidies), weakening the original policy objective. On the other hand, once the mandatory period for the provision of the service associated with a specific bidding process for infrastructure development has ended, the maintenance of this infrastructure in private hands could truncate the original promotion and access policy objectives over time. [32]

The above-mentioned is exacerbated by the lack of appropriation and use of these technologies, due to digital illiteracy among citizens with low paying capacity. At the international level, among OECD countries, Chile has the lowest fixed broadband subscription penetration, ranking 33 out of 35 states with a penetration rate of 15.9 subscriptions per 100 inhabitants (OECD, 2016). For this reason, as various organizations have proposed, public policies aimed at reducing the digital gap must be multidimensional, in addition to covering supply and demand factors. In this sense, it is also necessary to ensure control over the speed offered on fixed networks and to establish minimums[33] for more equitable access. Some of Subtel's latest initiatives, such as the Minimum Internet Speed Law, have been along these lines.

The investments needed to reduce the digital gap associated with the infrastructure deficit are investments in the last few miles and investment in long-distance or local transport networks and intermediaries (Subtel, 2018). They are essential not only for civil society

[30] 80% of the trunk network corresponds to the same route for the leading operators, being there some alternative sections for the south zone, which makes the country vulnerable to contingencies.
[31]Given the current regulatory framework, the State does not have the authority to deploy telecommunications infrastructure on its own.
[32] Notwithstanding the generations of conditions for private investment.
[33] It is difficult to establish minimums in mobile networks because the sharing of access is through the radioelectric spectrum and is affected by variables such as climate, movement speed of mobile phones and demand.

but also for productive development [34] (the Internet of things) and greater reach of public services (procedures, telemedicine, virtual classroom). In this sense, the deployment of infrastructure in low-intensity areas should be encouraged, considering incorporating different schemes to the current subsidy, to optimize the return on investment for operators intertemporally.

In short, it is essential to create the conditions for building new infrastructure and renewing existing infrastructure at the level of the first two layers. In particular, real backbone and aggregation networks need to be strengthened given the increased demand for data traffic. It is beyond the scope of this chapter to determine the optimal model for achieving this, but several open debates should be considered. One of them is some exhaustion of the subsidy model and consideration of other forms of public-private partnerships, as concession models. [35] These models could be linked to the Infrastructure Fund as a source of financing. Another debate is the level of vertical integration of telecommunications operators (internet providers) in the first and second layers, which affects competition by imposing entry barriers on new entrants. [36] The creation of telecommunication infrastructure operators could be considered, since nearly 80% of the amounts to be taken in correspond to passive infrastructure (towers, pipelines, etc.), which can be used by different operators, implying market efficiency leading to lower prices for end users.[37]

Recommendation 1.1: Assess and manage as a priority the lack of digital infrastructure in the first two layers that exacerbate the digital gap, for example, by encouraging investment in fixed network infrastructure by operators or other public-private partnerships.

Recommendation 1.2: Renew existing fiber backbone networks to ensure operational continuity, improve the quality and interoperability of aggregation networks.

Along with the need to increase digital infrastructure investment, it is also necessary to modernize its regulatory framework, which, with good managing, could allow for improved access and accelerate the development of new and modern networks.

The challenges of institutional modernization lie in the three layers of the digital ecosystem. As for the first layer regarding passive infrastructure, for example, there is no

[34]The CORFO and Subtel studies are highlighted in the obtention of a diagnosis of future connectivity and infrastructure needs. For example, see ACTI & Intelligent Industries (2017).

[35] Where the State entrusts the construction and operation of the broadband network to the private sector. The operation is an open network, operator-neutral and where all service providers can use it. The State maintains the ownership of the passive infrastructure, but the operation contract with the private company is long-term (e.g., 20 years). The contracted company commits the investment, generally with significant public financing, and takes the revenues and risks of the business for the stipulated term.

[36] In this way, if an Internet provider wants to attend a specific niche anywhere in Chile, it must first have the infrastructure (which belongs to the incumbent operators) that transport of data. Also, the overselling of services is not regulated or controlled so the quality may not be sufficient to provide final services.

[37] Disaggregation is not new in Chile; in the electricity sector, the transmission was separated from generation.

obligation to install pipelines to deploy optical fiber when new streets and roads are built. Likewise, neither the Housing and Urban Development Service (Serviu) nor the Ministry of Public Works has incorporated the deployment of data transport networks into its processes in social housing construction. Currently, the solution to these problems requires the coordination and good will of the agencies that receive the applications, for significant inefficiencies and waste of time in various authorizations are generated. [38] Just as there is a State organization for the physical infrastructure of public, private, and housing works, it is possible to complement this with the corresponding digital infrastructure.

Regarding regulation of active infrastructure (the second layer), the institutional framework lies mainly on Subtel, which applies and ensures compliance with the General Telecommunications Law. Subtel's has a dual role of authorization and supervision, which generates confusion. This can be corrected by implementing a Superintendence in charge of monitoring. Despite having a clear institutional framework on this point, the regulations and powers it holds were not designed and built for data. The digital infrastructure development needs mentioned above also require institutional adjustments for their implementation.

As for the third layer of services (OTT), there is a thin line of national and international providers. It is necessary to modernize the geographical regulatory framework to one unaffected by the geographical situation. In this manner, all market participants can compete with equal conditions, allowing users to enjoy similar conditions and rights, regardless of physical location.

In the face of these challenges, the Agendas institutional framework prevailing in Chile is insufficient as it is neither stable nor continuous through the different governments. The virtue of the Agendas is that they bring together the digital ecosystem stakeholders, and reach consensus on specific strategic axes embodied in a respective document that supports the agenda. However, they are not enough to provide stability and continuity within the organizational structure of the State. Additionally, there is significant dispersion in governance, for action plans are generated by three ministries, leading to the development of unconnected reports and bills, with different degrees of progress (cybersecurity, personal data, network neutrality, among others).

Countries that have developed this area better than Chile[39] exhibit institutions dedicated specially to think on the advance of the digital economy and accomplish projects in this area. These institutions have had robust legal support, [40] innovative structure and human capital, adequate budgets for their operation and greater political influence. Comparatively, Chile has a precarious institutional framework, based on the monitoring of digital projects, carried out by third- and fourth-line executives of the government structure, such as those in charge of Digital Agendas, Executive Secretaries or Heads of Electronic Government.

[38] An inefficiency and expensive example is to destroy the streets or roads when fiber optic networks are to be installed. Moreover, the tender for the public works construction could include the inclusion of telecommunications networks, which would also generate savings if it were offered as a joint package.
[39] For example, Australia and South Korea. Colombia and Uruguay stand out in Latin America.
[40] Superior to the decrees organized by the Committees of Ministers.

It is beyond this chapter's scope to determine the best institutional arrangement for the country. However, it is evident that the institutional framework, responsible for the digital ecosystem must be reexamined, considering contingent attributions, a cross-cutting perspective, and the capacity to define and promote public policies, regulate and control an industry that is facing dynamic and vertiginous changes. Not all the necessary functions will be within a single government agency, for example, oversight and promotion are often separate.

There are three alternatives for implementing a new institutional development: to take advantage of the current institutional framework by housing it in one of the three existing under-secretariats, [41] or to undertake it from the eventual Ministry of Science and Technology, [42] or to create a specific institutional framework such as a Ministry of Information and Communication Technologies. Regardless of the option chosen, the set of bodies that make up the new digital institutional framework must have guidelines beyond the governments in power, have the powers to effectively enforce the regulation, and work together with the other stakeholders that make up the digital economy.

Recommendation 1.3: To develop a new institutional framework with the powers to take charge of the digital ecosystem, including: (i) coordination and synergy at the level of the first layer of passive infrastructure, (ii) promotion, coordination, design and monitoring of the second layer of active infrastructure, and (iii) regulation of the third layer of services. Different entities should be in charge of the promotion and control functions.

1.5 Conclusions

There are multiple types of digital platforms, and some of them are currently the most highly valued companies worldwide. The digital economy and the platforms that enable it to have the potential to generate significant gains in efficiency and productivity representing an enormous opportunity in economic, social, political, ecological and labor terms. However, for digitization to bear fruit, it requires an enabling environment based on institutions and digital infrastructure, as well as appropriate regulations for these new businesses based on digital platforms.

This report aims to analyze the platforms and their impact on the Chilean case, seeking to maximize benefits through regulations that minimize negative externalities or other failures and impose the least possible burden on the regulator, the regulated and society. Chapter 2 focuses on general principles of proper regulation for digital platforms, addressing the areas of Competition, Taxation, Labour, Consumer Protection and Data. Audit issues, or "regulatory technology," are also reviewed. Chapters 3 to 6 deepen the analysis in four selected sectors: chapter 3 deals with passenger transport platforms, chapter 4 with booking accommodation platforms, Chapter 5 with financial services and Chapter 6 with telemedicine.

[41] Economy, Segpres, and Telecommunications, all have advantages and disadvantages.
[42] Bulletin 11101-19

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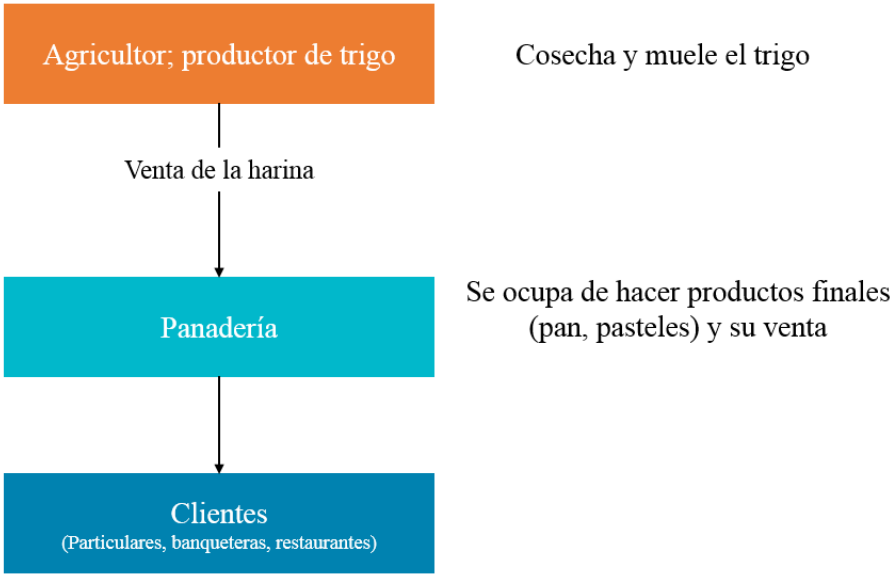
1.7 Annexes

Table A.1.1 Literature Review on Sharing Economies. Source: National Productivity Commission

Author(s)	Content
Benkler (2004)	- "Sharing" is a new modality of economic production. The "shareable" adjective to describe certain goods. - People acquire assets that have more functions than they need simply because they are included and do not use them to their fullest potential. - Innovating is about enabling the use of available but abandoned resources through digital platforms that make it easier to share them with those who need them.
Bauwen (2005)	- Defines the peer-to-peer (P2P) concept as a third mode of production, governance and ownership. - Decentralization of power and access to resources. - Reduction of information asymmetries in user-supplier and employee-employer relations.
Lessing (2008)	- Money does not always help, it can, at times, be destructive. - There are three types of economy: a commercial economy (value around money and price metrics), the sharing economy (value creation without the need for money and complex social relations) and a combination of both that adds value to the extent that the pure forms that compose it are distinguished.
Botsman y Rogers (2010)	- 21st century's sharing consumption replaces the 20th century's hyper-consumption: in hyper-consumption, credits finance purchasing decisions defined by advertising and property; while for sharing consumption, access is obtained through reputation and decisions are determined by a community that shares the untapped value of low-use assets. - The economic system allows access to products and services without the need to own the underlying assets re-allocate goods and exchange intangible assets.
Gansky (2010)	- Digital networks have made people's time slots and asset capacity shareable, thus increasing the economy´s efficiency.
Stephany (2015)	- Economic value is created through exchange, regardless of payment means (there may even be no payment). - The Internet facilitates real-time communication at a distance, enabling a community that operates based on trust and shares assets and services.

Botsman (2015)	- The collaborative economy is "an economic system of markets and decentralized networks that unlock the value of underutilized assets by connecting needs and ownership bypassing intermediaries. - A sharing economy platform (1) focuses on unleashing the value of low or nil for-profit or non-profit assets, (2) is based on principles of transparency and authenticity, (3) values, respects and empowers suppliers and cares about their economic and social well-being, (4) benefits consumers through efficient and ownership-free access to goods and services, and (5) the structure of distributed markets and decentralized networks creates a sense of community, collective responsibility and mutual benefit.
Sundararajan (2016)	- *Crowd-Based Capitalism* is a similar term that better summarizes the effect of platforms. - The five key characteristics are (1) it is largely market-based, (2) it makes optimal use of high-impact capital (either physical or human as skills and time), (3) it operates through networks based on decentralized multitudes of individuals (versus centralized and hierarchical institutions), (4) it merges personal and professional activities, and (5) it blurs the boundary between different modes of work, including employment and leisure. - The exchange of services through digital platforms allows for self-employment and demand-driven work that is characterized by flexibility, but also by instability with respect to benefits and income. - Petropoulus (2017)
Petropoulus (2017)	- The sharing economy connects people online who want to share assets and services. - It includes several business models that extend across multiple sectors so it is difficult to reach a single definition, but what they coincide in the use of assets with idle capacity. - Sharing economy platforms act as intermediaries that can offer greater security and transparency and generally benefit consumers. They can have adverse effects on established companies (as they are often subject to more restrictive rules) but also have positive spillover effects; and they access a large amount of data on the market and its users, that is not available to competition and the regulator. - A distinction must be made between professional and non-professional services through variables such as the frequency with which they provide the service, motives and remuneration. - Legal certainty and regulatory clarity are required to provide more incentives for the use of the new technologies.

Figure A.1.2. Vertical Structure of a Traditional Business (one side)



Source: National Productivity Commission