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Regulation and the “Productivity Revolution” in Japan’s Handset Market

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1. INTRODUCTION

The Progressive Policy Institute has long been focused on the interaction between regulation and innovation across the United States, Europe, and Asia.¹ We are particularly concerned with the broad class of pricing of innovative products and services.

From this perspective, we note that the Japanese government, acting through the Ministry of Internal Affairs and Communications (MIC) and the Japan Fair Trade Commission (JFTC), has required or encouraged mobile providers to reduce or eliminate their subsidies for consumer purchases of smartphone handsets. The government’s explicit goal is to persuade the providers to use the money saved from reduced subsidies to lower rates for long-term consumers.

In this paper, we observe that this policy is in direct contradiction to Prime Minister Shinzo Abe’s support for a “productivity revolution,” for three reasons.

- First, reducing handset subsidies deprives consumers of an important incentive to accelerate their purchase of handsets able to fully utilize the new advanced 5G networks that will soon be available. Such subsidies have traditionally been the main way to overcome the natural risk aversion of consumers to adopting the next wave of

mobile technologies. Instead, providers have reacted to regulator pressure by guiding consumers to low-end backward-looking handsets.

- With government policies slowing the purchase rate of innovative handsets, digital businesses are much less likely to invest in creating new "over-the-top" (OTT) services that fully utilize the advanced networks. This will limit productivity gains from the advanced networks.
- During periods of rapid technological change, mobile operator subsidies for innovative handsets actually have the effect of reducing the complexity of pricing plans from the

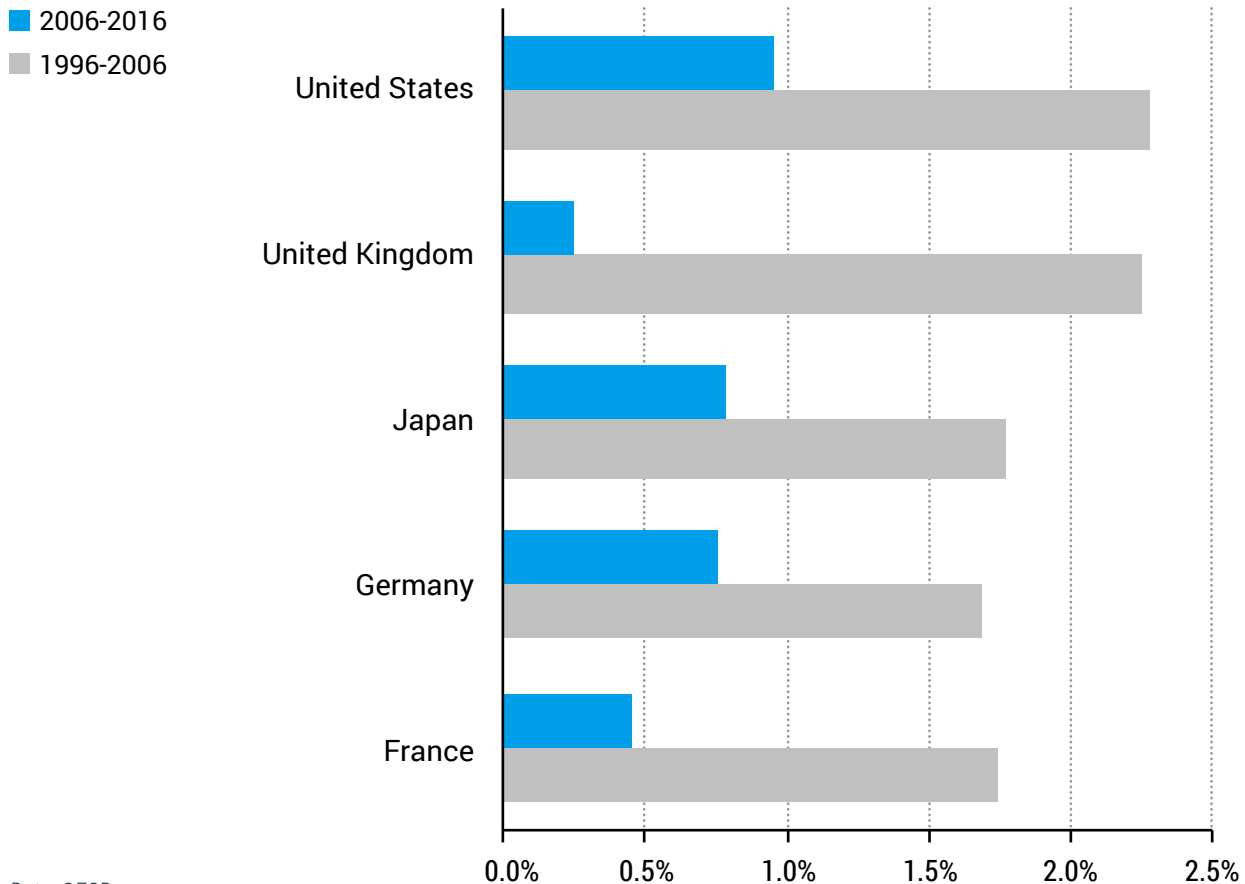
perspective of consumers. If subsidies are not allowed, then operators will resort to increasingly complex plans that are more difficult for consumers to compare.

Thus, we conclude that the policy of capping handset subsidies is likely to prove counterproductive in terms of generating more economic growth.

2. BACKGROUND

Like most other advanced countries, Japan is suffering from a sustained productivity slowdown. According to OECD data, Japan had productivity growth of only 0.8 percent annually between 2006 and 2016, a full percentage point lower than the previous ten years.

FIGURE 1: Global Productivity Slowdown (10-yr growth rate of real GDP per hour)



Data: OECD

In response, Prime Minister Shinzo Abe has recently announced a package of measures designed to create a new “productivity revolution” in Japan.² In particular, Abe focused on lowering the tax rate for companies that invest in new technologies such as “the Internet of Things” and opening up space for new providers of advanced telecom services such as 5G. Companies that invest ¥50 million or more in software and other tech purchases can deduct 3 percent of the investment amounts from their corporate taxes. Companies such as online retailer Rakuten will be able to get access to spectrum to set up their own mobile networks.

These innovation-enhancing measures from the Japanese government are very welcome. There is no doubt that innovation in the mobile space is essential for generating productivity gains in government, healthcare, and education. In our March 2017 report, “The Coming Productivity Boom,” we document the potential productivity gains from applying mobile to industries such as manufacturing, retail, healthcare, and transportation.³

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We are particularly optimistic about the ability of new technologies such as 5G to accelerate job creation and productivity growth in physical industries such as manufacturing and distribution. In the United States, ecommerce has created 240,000 well-paying jobs since 2015, and we expect that mobile will help foster the growth of a network of local manufacturing enterprises – what we call the “Internet of Goods.” In addition, mobile

technologies can boost productivity in industries such as healthcare by enabling innovation in telemedicine.

3. THE PATH TO GROWTH

Prime Minister Abe’s “productivity revolution” is premised on the correct assumption that we are moving into a period of rapid technological change. That is clearly true in the case of 5G mobile, which is up to 20 times faster than the current system, with lower latency. These new capabilities will allow digital businesses to provide many new “over-the-top” (OTT) services to consumers and to other businesses.

These new productivity-enhancing OTT services will not be the video, games, and entertainment that make up the bulk of online usage today. Rather, these digital businesses will be built on a new generation of mobile apps that will be far more sophisticated and reliable than today’s apps.

Perhaps the most obvious example is a new digital business that would offer mobile health monitoring. Such applications of the 5G networks have the potential for greatly improving the productivity of healthcare services – especially in rural areas where there are large aging populations.

However, it is important to realize that such a digital business would require large startup costs. These startup costs include building up a dependable infrastructure to handle large flows of data, and the human resources to be able to respond to medical emergencies reliably.

In many of these cases, full use of these new services will require next-generation handsets as well, capable of reliably using the new OTT services. For example, next-generation handsets may include sensors able to monitor heart

rhythms. Similarly, there may be services that require high-end cameras in handsets in order to be able to handle augmented reality (AR) services.

Such applications of the 5G networks have the potential for greatly improving the productivity of healthcare services, especially in rural areas where there are large aging populations.

As a result, the Japanese economy, like other advanced economies, faces an important three-way coordination problem. Mobile providers have to make the major investment in new networks well before any revenue comes in. Widespread deployment of 5G requires heavy investment in many small cells and the necessary links for backhaul. The major Japanese mobile providers – NTT Docomo, KDDI, and SoftBank – are expected to spend 5 trillion yen over the next ten years.

But the new networks by themselves are not enough to generate growth. Digital businesses

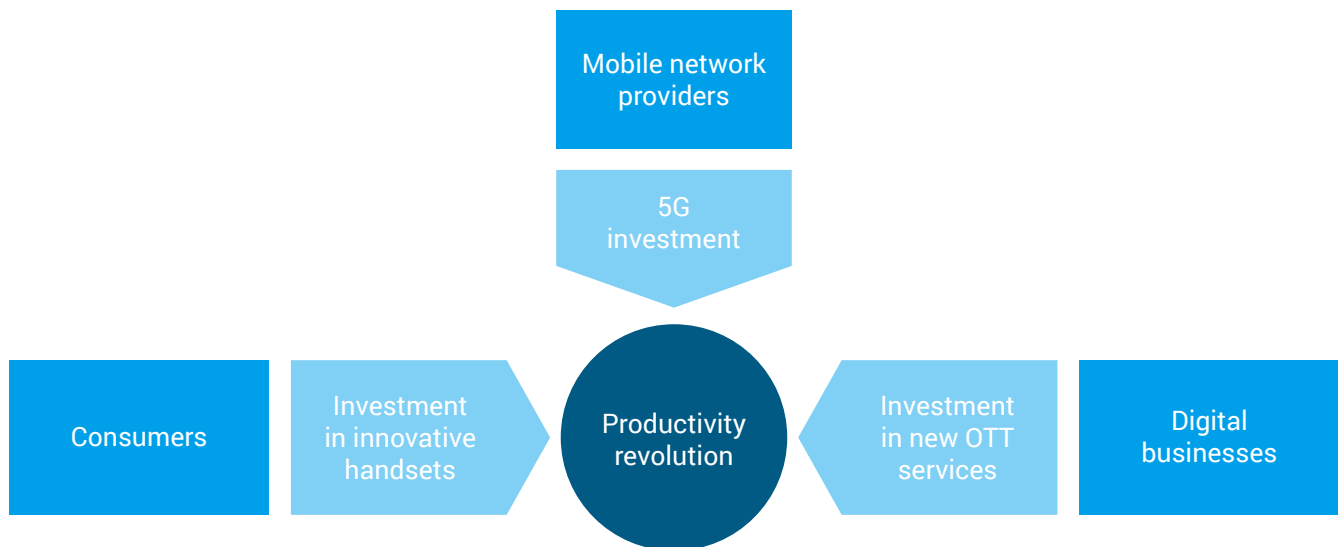
have to invest in the technology infrastructure and human resources that allow them to deliver new OTT services that use the new network.

Finally consumers have to be willing to acquire handsets that allow them to reliably use the new OTT services. Ability to access 5G is only the start. The handsets will need to have more processing power, more memory, better sensors, and more capabilities.

TABLE 1: Three-Way Coordination for Growth

- Mobile providers have to invest in advanced networks.
- Digital businesses have to invest in the human and physical infrastructure needed to provide new OTT services utilizing advanced networks.
- Consumers have to invest in new advanced handsets that allow them to reliably access new OTT services.

FIGURE 2: The Three-Way Coordination Problem



4. HOW HANDSET SUBSIDIES HELP SOLVE THE THREE-WAY COORDINATION PROBLEM

Note that all three legs of the stool have to be in place to accelerate productivity growth. Obviously, Japanese mobile operators are working aggressively to showcase 5G in time for the Summer Olympics in 2020, when Tokyo hosts the games. For example, mobile carrier NTT Docomo Inc. is aiming to roll out a fifth-generation (5G) mobile network in time to live-stream Tokyo 2020 Olympic and Paralympic events to virtual reality (VR) headsets.⁴

The second leg of the stool is the willingness of digital businesses to invest in providing new services that use the advanced networks. Prime Minister Abe’s plan to cut taxes for companies that invest in new technology will encourage companies to invest in capacity for providing new services.

What about the third leg of the stool – consumers? Historically, at moments of technological disruption, handset subsidies have played a key role in solving the three-way coordination problem. Carriers in the United States, Japan, and Europe have provided consumers with subsidies for buying handsets that can use their new networks.

Much of the research that has been done over the past ten years, both before and after the introduction of the iPhone in 2007, suggests that handset subsidies are a key strategy for accelerating adoption. In 2004, two researchers in Finland (home to Nokia, then the largest cellphone maker in the world) wrote:

Our main conclusion is that consumer subsidies, either government- or operator-funded, can be economically efficient from the national viewpoint when applied for faster adoption of a specific technology

at the right time window in a temporary manner.⁵

A 2013 OECD report on handset acquisition markets notes that handset subsidies:

...play a substantial role in users taking up or upgrading their smartphone devices at a faster pace than they would otherwise, and, therefore, in assisting the faster adoption of mobile broadband services. They do this by extending credit to users of smartphones who may prefer to pay back the cost of a device over the length of a contract rather than the full upfront cost.⁶

Indeed, handset subsidies are the obvious mechanism for encouraging the rapid uptake of new technologies by consumers. The reason is simple: Leaving aside early-adopters, ordinary consumers face three major hesitations before investing in a next-generation handset, assuming their current handset is still operational.

1. **Risk aversion.** The typical consumer is risk averse, especially when faced with a major new technology such as 5G. They will tend to hesitate investing in a next-generation handset until the technology’s worth is proven.
2. **Liquidity constraints.** Even if the consumer is ready to buy a next-generation handset, low-income households are likely to hesitate because of the cost.
3. **Lack of new services that require an innovative handset.** In the early stages of a new technology, digital businesses do not yet exist that would use the new capabilities of the technology. Thus, consumers are being

asked to invest in an innovative handset that initially does not offer access to new services.

At the same time, mobile providers are well positioned to help overcome consumer hesitancy to purchasing innovative handsets. Consider the following points.

- 1. Less risk averse.** The provider has better information about the capabilities of the new technology than consumers do, and is therefore more willing to absorb the risk.
- 2. Network effects.** As the number of consumers with innovative handsets rises, digital businesses will have more incentive to invest in OTT services that use the capabilities of the new advanced networks, making the networks more valuable.
- 3. Better liquidity.** As large companies with access to the capital markets, providers generally face much lower interest rates than most consumers.
- 4. Reduced income effects.** It is important from a social perspective that access to next-generation handsets be widely distributed.
- 5. Marginal cost pricing of a new network.** When a new, more advanced network is built that requires new handsets, it starts by being underutilized. An underutilized network has a very low marginal cost. It is then economically optimal for the provider to offer new subscribers to the network a better deal by subsidizing their new phone.

It becomes clear that upfront subsidies for handset purchases, combined with multiyear contracts, benefit both consumers and providers. Consumers don't have to make a big investment up front, at a time when their risk aversion is highest, because the handsets are subsidized. Then, as they learn about the benefits of the new technology through use over time, their risk aversion fades and payment of the monthly fees seems worthwhile.

Access to innovative handsets is a key element in the participation in today's society, which should be as widely distributed as possible.

This effect is even stronger for liquidity-constrained consumers, who may be reluctant to borrow for innovative handsets. The ability of the mobile providers to use their lower cost of capital to help facilitate these transactions is important both economically and socially. Access to innovative handsets is a key element in the participation in today's society, which should be as widely distributed as possible.

Finally, note that network effects play a key role, because of the impact on new OTT services. When consumers are considering their decision to buy a new innovative handset, they do not factor in the impact their buying decision may have on business investment. In the next section we will consider this impact.

5. THE EFFECTS OF GOVERNMENT PRESSURE TO REDUCE HANDSET SUBSIDIES

The Japanese government has steadily put pressure on mobile providers to reduce the amount of handset subsidies, with the goal of driving down monthly rates for customers. For example, in October 2016, Japan’s major mobile operators were penalized for providing excess handset subsidies.⁷

As a result, Japanese mobile operators have substantially reduced subsidies for handsets, while offering monthly discounts on posted rates to a subset of their customers. In May 2017, NTT Docomo announced it was offering targeted subsidies if consumers buy one of a relatively small number of low-end and mid-range models. At the time, news reports noted that “[t]he eligible models, priced between ¥20,000 and ¥40,000, have fewer functions than luxury models that cost around ¥100,000.”⁸

It’s worth noting at this point three important global trends. First, American, European, and some Asian carriers have been voluntarily retreating from handset subsidies. In most cases, analysts believe such changes increase the profits of the carriers rather than going into lower rates. A March 2017 report from GlobalData reports:

Operator profitability in the mobile segment in Europe is under pressure, particularly in more mature markets where expensive handsets are often subsidized in order to drive growth in high ARPU postpaid segments. In retracting device subsidy offers, operators have the potential to ease this financial pressure and lower the cost per customer acquisition.⁹

Another paper from consulting firm Cap Gemini came to the same conclusion.

Subscriber acquisition costs for most operators are a major constituent of network operating expenditure, with a large proportion contributed by handset subsidies. While competitive pressures are unlikely to allow operators to remove subsidies, operators can cut subsidy-related costs by encouraging longer contract durations and increasing the handset replacement cycle.¹⁰

In Thailand, a report from Fitch Ratings notes that Thai mobile-phone operators’ strategy to reduce handset subsidies gradually is likely to improve their profitability.

The second trend is that regulators in some countries have been backing away from mandatory caps on handset subsidies. For example, in September 2017, South Korea announced it was discontinuing caps on handset subsidies.¹¹

The third trend is that there is no apparent correlation between innovation, productivity growth and mobile broadband prices, as reported by the OECD.¹² Germany’s mobile broadband rates for high usage are double that of France, but Germany has much faster productivity growth. Similarly, the United States has much faster productivity growth than the United Kingdom, even though the OECD figures show the United States with higher mobile rates.

These three trends are consistent in the sense that markets are capable of self-adjusting in the face of innovation much faster than regulators can. A 2016 paper from two South Korean researchers makes exactly this point. They analyzed the impact of capping handset subsidies:

...the ban of or putting a ceiling on handset subsidies reduces social welfare because, as the handset subsidy is regulated, consumers have to pay more for handsets or give up purchasing new products and service, and profits of providers are also reduced due to the decrease in demand. If the bundling of mobile carriers is prohibited, then price competition between handset manufacturers occurs, but the social welfare will not improve because the competition will not reduce handset prices as much as the price with the current subsidy level. Thus, in this paper, we argue that the most effective way to improve social welfare is to let the market decide.¹³

To put it differently, restrictions on handset subsidies distort the market. These market distortions are bigger during periods of rapid technological change, when providers may find it optimal to increase their subsidies, but aren't allowed to do so.

The biggest negative impact, however, may not be on providers or consumers, but on digital businesses that hope to start new OTT services using the advanced features of the new networks. For them, the desirability of investment and the possibility of success are directly tied to the size of the potential market – that is, owners of innovative handsets.

To the degree that the cap on handset subsidies slows the growth of the potential market for new OTT services, this slower growth translates directly into less business investment and less productivity gains. That is, regulation of handset subsidies has consequences that go far beyond the telecom markets themselves.

A simple example will illustrate this issue. Let's suppose the demand (D) for innovative handsets

is a function of the relative price (P) for the handset compared to existing handsets and the level of new services (S) available for that handset.

Meanwhile, digital businesses are more willing to invest in providing new OTT services if they foresee a bigger market. As a result, the level of new services (S) is a positive function of the demand D for innovative handsets.

$$D = a - bP + cS$$

$$S = mD - n$$

In general, consumers will make their buying decisions holding the expected level of OTT services (S) fixed. They don't take into account that their decision to buy an innovative phone will increase the size of the market and therefore the level of new services they get.

So, in this very simplified model, if $P > a/b$, there is no demand (D) for innovative handsets, and no investment in innovative services S. This is the slow growth path.

However, if there is a handset subsidy (h) such that $P - h < a/b$, then we have the fast growth path where it makes sense for consumers to buy innovative handsets and businesses to invest in providing new services (S). The exact path and optimal subsidy, of course, depends on the parameter values. We note that, under some conditions, it is optimal to fully subsidize the handset.

We note that if we introduce the rate R for mobile services into the equations above, the qualitative conclusion remains the same. Lowering the rate R is not an effective tool for speeding innovation, since it applies to existing handsets as well as advanced handsets.

We also note that economists have become

increasingly worried about the slow rate of innovation adoption across all developed countries. In the seminal 2015 report, *The Future of Productivity*, OECD economists wrote:

...knowledge diffusion should not be taken for granted. Future growth will largely depend on our ability to revive the diffusion machine.

From this perspective, the role of subsidies in accelerating the adoption of new mobile technologies should not be underestimated. At times of rapid technological change, handset subsidies are an important tool for shifting the economy from a slow-growth path to a fast-growth path.

6. PRICE COMPLEXITY AND TECHNOLOGICAL CHANGE

Now let us turn to a slightly different issue. Regulators across the globe have long been suspicious of handset subsidies from the perspective of price transparency. Their fear was that consumers would find it difficult to understand the true price of mobile service when the monthly fees bundled together both the charge for service and the repayment of the cost of the handset. Thus, the move to reduce or eliminate handset subsidies has been driven in part by the desire to make mobile plans more transparent and increase competition.

It is interesting to note that South Korea recently removed the cap on handset subsidies in order to make pricing plans more transparent. As a recent newspaper article noted:

The South Korean government has decided to remove the upper limit of 330,000 won (\$289) for the subsidies as part of the efforts to lessen the telecommunication cost burden on consumers and to make

subsidies’ packages more transparent.

The limit had been in place for the past three years to cool down excessive competition among three mobile carriers attracting subscribers by offering higher subsidies upon new phone purchases. The limit, however, was highly criticized for egging on expedient ways of providing higher discounts to only select, well-informed customers, or only offering high subsidies for expensive devices.¹³

Especially during periods of rapid technological change, handset subsidies actually provide consumers with more price transparency rather than less.

Recall from earlier in this report that consumers suffer from three issues in dealing with new technology: Risk aversion, liquidity constraints, and lack of new services. In the case of the introduction of new innovative handsets, these three issues are solvable by means of a combination of upfront subsidies tied to a multiyear contract. The cost of the handset is bundled with the monthly service fees in a straightforward contract that is easily comparable between carriers. Then, when the contract is up, the consumer is offered the same set of choices.

From the perspective of regulators, these contracts are not transparent – because consumers cannot easily compare them to a stand-alone fully-price handset plus monthly fees for mobile service. On the other hand, in a period of rapid technological change, the regulatory analysis does not take into account the three factors identified in section 4 that lead to consumer hesitancy in purchasing advanced handsets: Risk aversion, liquidity constraints,

and the lack of new services. Moreover, regulators are considering that the handset subsidies affect the market for second-hand devices.

Thus, in a period of rapid technological change, handset subsidies actually simplify consumer decisions by reducing the number of factors consumers need to take into account when making comparisons. For example, a consumer doesn’t need to worry about assessing the probability of new services actually being available, since the upfront cost of the innovative handset is subsidized.

Is this taking advantage of consumer myopia? No, it is simply acknowledging that it is difficult for consumers to make fully foresighted decisions at a time of rapid technological progress. When the first iPhone was introduced in 2007, not even experts were able to foretell the creation of the App Store a year later. If experts can’t accurately predict technological developments, how can consumers be expected to?

We can construct a **price complexity index** that takes these factors into account. In the simplest terms, a price complexity index should measure how many different pieces of information a consumer needs to consider at the time of purchase in order to make a decision.

Innovative products are by nature more complicated to assess and compare with other products in the same category. They offer new capabilities – the value of which may require major investment by businesses to make useful.

Once again the clearest example is mobile applications. At the time the first iPhone came out, it was not obvious at all that developers were going to write tremendous numbers of useful mobile apps to take advantage of the new capabilities of smart phones.

Moreover, consumers spend more time and energy assessing large purchases compared to small purchases, relative to their household budgets. The demands for information are much higher for large purchases, including how long they will last and how they compare to similar large purchases. There’s also the potential for a large regret factor – what if they buy the wrong product and have to live with it for years?

A product with a high price complexity index is difficult to compare with similar products. The intensity of price competition declines when there are more factors to consider. For example, previous-generation handsets have a well-understood set of capabilities, so it’s easy to compare them by price as standalone products.

Note that sellers can change the price complexity index of their products in either direction. They can offer a standard low-cost bundle that is easy for consumers to compare, or they can add on new features that require additional time and energy for consumers to assess. For example, as they’ve reduced handset subsidies, mobile companies have started offering more complicated discounts to consumers.

The intensity of price competition declines when there are more factors to consider.

TABLE 2

	PRICE COMPLEXITY*	EXPLANATION
Unbundled low-end handset	LOW	Well-understood, limited set of features.
Targeted low-end handsets with discounted communications fees	MEDIUM TO HIGH	Carriers are making price schemes more complex in order to price differentiate and reduce competitive pressures.
Innovative handset with subsidy	LOW	Consumers have a simplified decision that is available to everyone.

**Price complexity measures how many pieces of information a consumer to consider in order to make a purchasing decision
Data: PPI*

Thus, the best way to reduce price complexity for consumers at a time of rapid technological change may be to allow contracts that include handset subsidies.

CONCLUSIONS

During periods of rapid technological change, it is often necessary to take measures to accelerate the adoption of new technologies. This is especially true if there are network effects.

In the case of advanced mobile technologies such as 5G, the network effects are driven by the relationship between consumer adoption of innovative handsets and the willingness of digital businesses to invest in creating new OTT services that make use of the advanced

mobile technologies. The acceleration of such synergistic effects is essential to achieve Prime Minister Abe’s productivity revolution.

Handset subsidies have historically been an essential tool for accelerating adoption of new mobile technologies by consumers. Consumers tend to be risk averse, liquidity constrained, and concerned about the availability of new OTT services. For them to “take the leap,” they must be given incentives.

As a result, the government’s effort to eliminate handset subsidies may be guiding consumers to low-end, backward-looking technologies at just the wrong time. The right policy is to accelerate technological adoption, not slow it down.

About the Author

Dr. Michael Mandel is the chief economic strategist at the Progressive Policy Institute and a senior fellow at Wharton’s Mack Institute for Innovation Management.

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