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THE PROMISE AND PITFALLS OF E-SCOOTER SHARING

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IF MARKET GROWTH WERE vehicle acceleration, the humble electric scooter—the latest answer to urban mobility—would be a Ferrari. Since their debut (by US-based Bird) in the fall of 2017, shared e-scooters are now in service in hundreds of cities worldwide, and more launches are planned in the coming months. A dozen e-scooter startups have already attracted more than $1.5 billion in funding, and we estimate that the global market will reach about $40 billion to $50 billion by 2025.

But several factors will put the brakes on e-scooter growth, if they haven't already. Right now, the unit economics don't add up, and with so crowded a field, consolidation is inevitable. So is greater regulation: as e-scooters proliferate, cities need to sort out traffic rules, public safety, parking, permits, and liability issues. The big question—for service providers, investors, urban planners, and consumers alike—is whether e-scooters can overcome these hurdles and become a staple of urban micromobility.
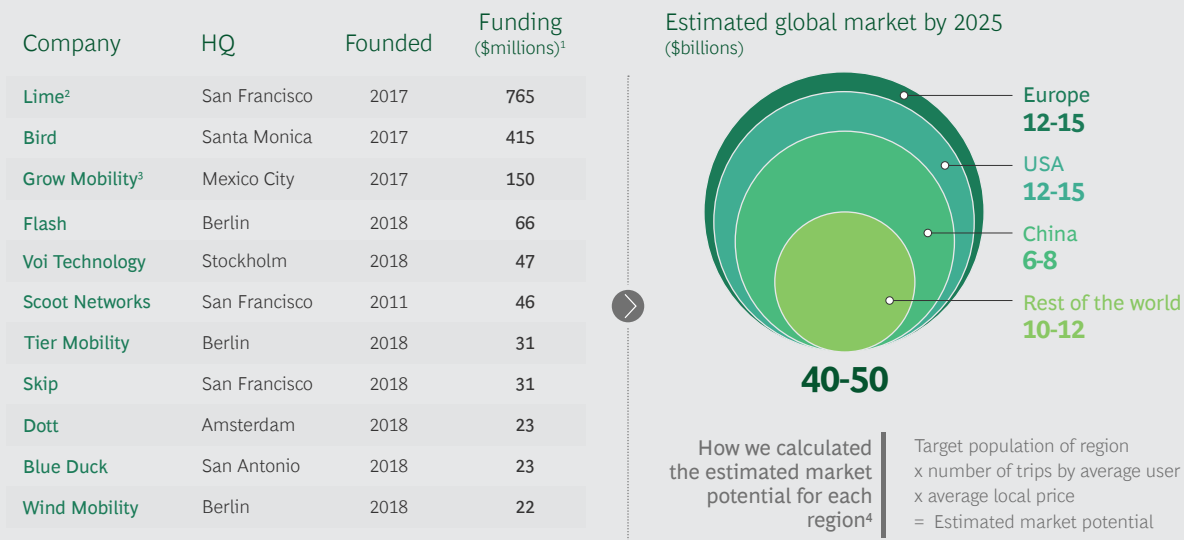
Why the E-Scooter?

Still in their infancy, the biggest names in e-scooter sharing—Bird and Lime—have each amassed hundreds of millions of dollars in funding. Many more startups have raised more than $20 million each. (See Exhibit 1.) How to explain this explosion and the forecasts of eye-popping growth worldwide?

The rapid rise of shared mobility—through ride hailing, car sharing, and shared public bicycle systems—paved the way for e-scooters, responding to the public's appetite for cheap, convenient, and flexible ways to quickly get around increasingly congested cities. But even beyond the practicality of e-scooters is the element of fun that they offer: anyone—whether an executive in a suit or a student in jeans—can enjoy feeling like a little kid again.

Roughly 35% of all personal trips cover distances of less than 2 kilometers (km), and 75% of them amount to less than 10 km. E-scooters are typically used for trips from 0.5 km to 4 km, the equivalent of

Company	HQ	Founded	Funding ($millions)[1]
Lime[2]	San Francisco	2017	765
Bird	Santa Monica	2017	415
Grow Mobility[3]	Mexico City	2017	150
Flash	Berlin	2018	66
Voi Technology	Stockholm	2018	47
Scoot Networks	San Francisco	2011	46
Tier Mobility	Berlin	2018	31
Skip	San Francisco	2018	31
Dott	Amsterdam	2018	23
Blue Duck	San Antonio	2018	23
Wind Mobility	Berlin	2018	22

Estimated global market by 2025 ($billions)

Europe **12-15**
USA **12-15**
China **6-8**
Rest of the world **10-12**

40-50

How we calculated the estimated market potential for each region[4]

Target population of region
x number of trips by average user
x average local price
= Estimated market potential

Sources: Crunchbase; Pitchbook; TechCrunch; BCG analysis.
Note: This list includes e-scooter-sharing startups with reported funding of more than $20 million, but it excludes corporate ventures (such as Lyft Scooters or Daimler's Hive) and startups bought up by other firms (such as JUMP and Spin, acquired by Uber and Ford, respectively).
[1]As of April 1, 2019.
[2]Lime originated as a bike-sharing company.
[3]Grow Mobility was formed in 2019 through the merger of Mexico-based Grin (founded 2018) and Brazil-based Yellow (founded 2017).
[4]To estimate the number of trips (standalone and intermodal) by the average user, we accounted for such factors as trip purpose, e-scooter availability, weather, and general consumer preferences. Target population estimates factored in age, geography, and fitness level. The average local price represents the average use fee plus average minutes within the given region.

walking for 5 to 45 minutes. (See Exhibit 2.) In theory, therefore, e-scooters could be used for a large proportion of in-town travel. E-scooters fit the bill for other reasons as well: they're cheaper than hailing a ride-share vehicle, you don't have to hunt for a parking space, and no sweating is involved. They can also be paired with other mobility modes (especially public transportation), thus making them a handy solution for traveling the first and last miles from home to station.

E-scooters have their limitations, however. They don't perform well in hilly areas or on brick-lined streets; they're ill-suited for inclement weather; and riders have nowhere to stow groceries or other belongings. E-scooter-sharing providers are already in discussions with some manufacturers, including Xiaomi and Segway, about next-generation product changes that would address these needs. Among the most important modifications are stronger engines and more durable construction.
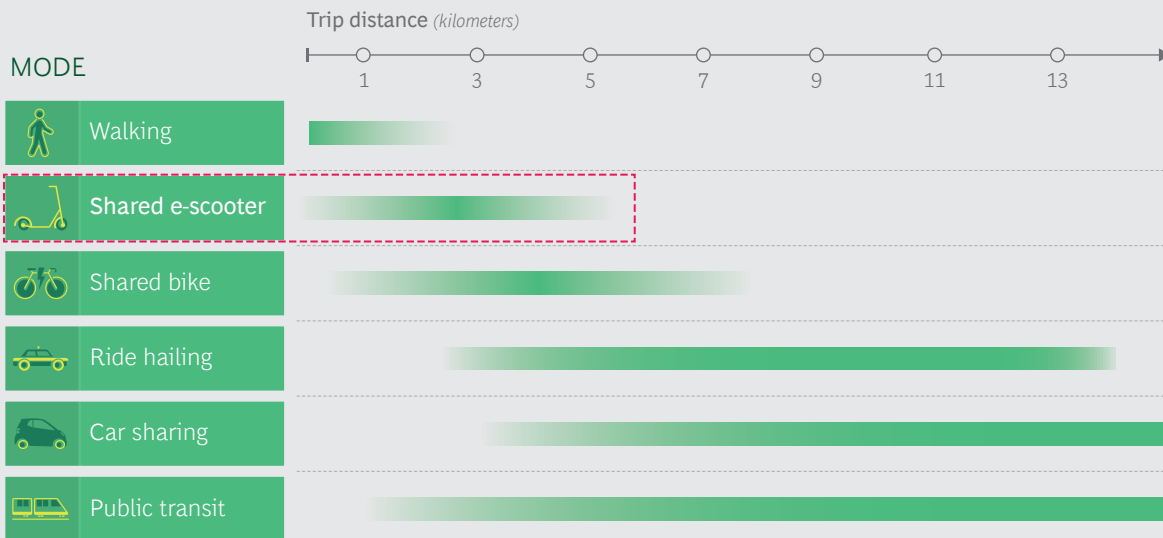
The Scooter-Sharing Market Is Big but Uncertain

Ride-hailing services have already demonstrated how quickly shared-mobility modes can be adopted by the public. In 2015, for example, only 15% of US adults had ever used Uber or Lyft, but by 2018, that figure had risen to 36% overall (45% for city dwellers).

Our estimate of the global market for shared e-scooter rides—potentially $40 billion to $50 billion by 2025, as Exhibit 1 shows—would be about 15% of the size of the market for automotive-based on-demand mobility for that year, according to our calculations. Given that shared e-scooters are generally used more for private modes and for shorter trips, they will likely expand rather than erode the existing market for on-demand mobility.

Still, for all the advantages that e-scooter-sharing offers, its mass adoption is hardly a certainty. For one thing, there may not be sufficient consumer demand, particularly in cities with populations of less than

EXHIBIT 2 | E-Scooters Are Best Suited for Shorter Distances

Trip distance *(kilometers)*

MODE	
Walking	
Shared e-scooter	
Shared bike	
Ride hailing	
Car sharing	
Public transit	

Source: BCG analysis.

100,000. Frequent users might find it more economical to buy their own e-scooters, given the relatively modest starting retail cost of around $400. In addition, e-scooters' introduction—especially in cities where they seemed to appear overnight—has generated mixed reactions and a variety of problems related to right-of-way rules, public safety, parking, and liability. For these and other reasons, many of the world's largest cities have not yet welcomed e-scooters. (For instance, as of this writing, scooters have not yet been sanctioned in Germany, although legislation permitting their regulated use is expected to pass shortly.)

Solving the Current Profitability Challenge

While the market potential for e-scooters is promising, their unit economics, at least for the first generation of vehicles, are challenging. Today's e-scooters are not profitable.

The average e-scooter currently has a lifespan of just three months. E-scooters were originally designed for private use, not for rental, so the heavy usage, rough handling, and even vandalism that users inflict on them have dramatically cut down on their durability. Yet despite the modest cost of
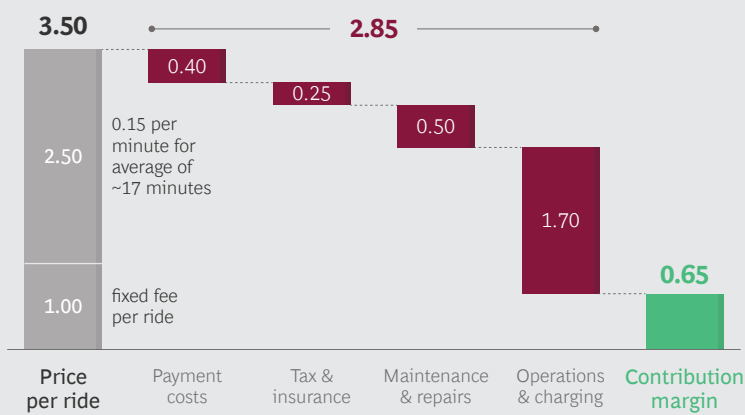
an e-scooter, it takes almost four months, not counting marketing and overhead expenses, for a rental company to break even on its investment. (See Exhibit 3.)

The biggest costs today arise from operations and charging. Every day, providers typically collect the e-scooters; transport them to a central facility for battery charging, maintenance, and repairs; and then redistribute them for the next day. The additional costs incurred are substantial. Some providers try to defray these expenses by using a "crowd-charging" model, in which they pay the user (in cash or e-scooter minutes) to take the e-scooter home for charging and then return it the next day.

Fortunately, improvements are already in the works. Longer-lasting or swappable batteries will reduce the need for charging and operations. At current price levels, e-scooters will likely generate a profit if they can last around six months; several providers are developing their own hardware to boost product durability to as much as ten months (and some have already rolled out a more rugged line of e-scooters). These measures, along with economies of scale in production, will enhance e-scooters' profitability considerably.

E-scooter unit economics in US market ($)

3.50		**2.85**			

Price per ride: 3.50
2.50 — 0.15 per minute for average of ~17 minutes
1.00 — fixed fee per ride

Payment costs: 0.40
Tax & insurance: 0.25
Maintenance & repairs: 0.50
Operations & charging: 1.70
Contribution margin: 0.65

Contribution margin per day:
$3.25
$0.65 per ride x
5 rides per day (average)

Time to break even:
115 days = 3.8 months
Average vehicle price of $375 ÷
daily contribution margin of $3.25

Durability:
~3 months

Sources: Expert interviews; BCG analysis.
Note: Our calculations represent the average unit economics before Bird's recently announced price increases.

The Battle for Market Share

In their bid for market share, e-scooter providers and their investors are willing to sacrifice early profitability to establish a foothold while pursuing efforts to fortify product durability. The competition continues to intensify: wide-scale rollout, which has already unfolded across the US, is just getting under way in Europe, and many companies are launching their programs simultaneously in individual cities. Six e-scooter companies (Lime, Bird, Tier Mobility, Wind Mobility, Flash, and Hive) currently compete in Vienna alone, for example, and two more (Voi Technology and Arolla) are reportedly considering entry there. But can eight e-scooter providers coexist profitably in one city?

Providers can't overcome the fact that their offerings are hard to differentiate. Consumers regard e-scooters as a commodity; they'll pick the closest available scooter. Thus far, putting a high-quality, reliable product on virtually every corner is apparently all the marketing that providers have needed. But over time, companies competing with others in the same neighborhood will have to establish brand loyalty.

To build critical mass in their customer base, providers will need to spend on marketing and offer promotional discounts, which will drive up their customer acquisition costs. At the same time, oversupply might necessitate price cuts and trigger a price war. (But note that one of the market leaders, Bird, announced per-minute fee increases in April of this year, presumably in an effort to improve e-scooters' unit economics. It's hard to say at this point whether one company's increase will have a direct effect on the market.)

What's more, providers won't be competing on price alone: they will be fighting over turf and e-scooter availability. To win over a city, they will likely need to make more e-scooters available in a wider radius than their competitors. Doing so, however, will undermine asset utilization. Poorer utilization rates, along with greater marketing expenses, will translate into substantially higher costs.

Consolidation is inevitable. Investors could well grow anxious about continuing to bankroll startups as they burn through their cash.

The question is: will regional entities be able to achieve market dominance in individual cities or countries, or will global companies beat them on their territory? If the ride-hailing industry offers a clue, it's highly possible that some regional players will dominate, or at least compete head-to-head with, the global companies.

Critical Maneuvers for Providers

To secure market leadership, e-scooter providers will have to take the following actions:

- **Optimize operations.** To maintain, charge, and relocate several thousand e-scooters in every city of operation is a major operational challenge. Reducing these costs to well below 50% of revenue will be essential for profitability.

- **Bolster product durability.** Substantially extending the average life of an e-scooter is critical, as is improving battery life, making repair easy, and finding better solutions to manage mechanical breakdown, vandalism, and theft.

- **Forge a strategy for rapid growth.** Scaling up quickly will help companies amass a customer base and preempt competitors. Beyond e-scooters, companies could broaden their offerings to include other mobility modes, such as shared bikes. More important, they will need to establish partnerships with complementary mobility providers (such as car-sharing and ride-hailing services) to lock in users more effectively. Partnering with public-transit agencies at local and regional levels will also help support growth.

- **Beef up funding.** Raising large war chests will allow companies to finance sufficient production capacity, as well as expansion into more cities, while buying time to break even.

Yet these efforts alone won't be enough. As purveyors of transportation operating on public streets, e-scooter companies will also need to address two major policy challenges:

- **Regulation.** Seeking favorable and civic-minded regulation at the local, state, and federal levels means anticipating such concerns as reducing curbside clutter and congestion on sidewalks and streets as well as in other public places. It also means encouraging realistic approaches to taxation that don't cripple industry growth.

- **Rider Liability.** Clarifying the respective liabilities of e-scooter riders and providers is becoming ever more crucial (particularly in the US) as accidents increase.

Opportunities for Mobility Service Providers and Platforms

Digital mobility providers—ride-hailing, car-sharing, and car-rental services—need to act promptly to define their e-scooter strategies. Established providers must decide whether (and how) to integrate existing e-scooter-sharing services or whether to buy an existing provider. Partnerships—including those with public-transit agencies—will be key so that consumers can plan, book, and pay for intermodal trips.

Because e-scooter rides can complement other modes of transportation (especially public transit), aggregating modes into a single app would be more convenient and valuable for consumers. The user would then have a single source to visit for getting from point A to point B—a one-stop shop for planning, booking, and paying for their trips. Uber is advancing fast in its bid to become just such a multimodal mobility provider: in 2018, it acquired JUMP, a dockless bike-sharing and e-scooter-sharing startup; launched a partnership with Getaround to integrate car rental into its app; and announced a pilot with the city of Denver to offer tickets for public transit.

A number of European cities are developing their own on-demand mobility offerings that integrate public transportation with bike sharing, car sharing, and other mobility options. With their established customer bases, public-transportation agencies are well positioned to act as a central or hub provider; many already offer their own ticketing apps. But to what extent consumers will opt for a local municipal offering over a potentially more alluring regional or even global one is still unknown.

How Cities Can Manage E-Scooters

Not surprisingly, many cities are concerned about the unbridled growth of e-scooters, given the problems (such as obstructed sidewalks and vandalism) unleashed by the rapid rise of free-floating bicycles. In 2018 for example, San Francisco and Indianapolis backpedaled on e-scooters, putting restrictions on their use; in New York and Chicago, e-scooters are currently banned.

In the US, at least, e-scooters are unlikely to transform the urban landscape overnight. But leaders should not let recent missteps color their views on e-scooters. When introduced properly, e-scooters can alleviate some of the seemingly intractable challenges that cities and their residents face—namely congestion, pollution, and the difficulty of bridging the first- and last-mile gaps.

To start with, cities can penalize or impose limitations on providers that do not abide by existing rules. But they can do much more, proactively, to foster the benefits and bypass the pitfalls. For instance, Portland, Oregon, has adopted a sensible approach, starting with a pilot program to test impacts. (See the sidebar "Portland's Proactive Approach to E-Scooter Regulation.") In the city's initial study, 34% of local passengers and 48% of visitors took an e-scooter instead of driving their cars or using Uber, Lyft, or a taxi, proving that the potential for reducing car traffic is promising.

Elsewhere, cities are experimenting with other policies and practices, such as designated parking zones and licensing by jurisdiction. Lisbon, for example, has taken a cue from pioneering US cities and established no-parking zones for e-scooters. In Madrid, providers must now obtain licenses to operate in their own designated areas of the city and are required to ensure that their e-scooters will be parked within their prescribed area for a minimum amount of time. They must also report usage data to the city.

PORTLAND'S PROACTIVE APPROACH TO E-SCOOTER REGULATION

To avoid many of the problems that other cities have experienced, Portland, Oregon, was determined to develop sound regulations from the get-go. In June 2018, the Portland Bureau of Transportation (PBOT) began requiring e-scooter providers to apply for permits; one month later, it launched a pilot e-scooter program.

The four-month pilot had four major objectives: to reduce traffic congestion, prevent serious injuries and fatalities, expand access for Portlanders underserved by existing public transit, and decrease air pollution. PBOT also required participating companies to provide data on starting points and destinations, real-time availability, routes taken, and accidents.

The city discovered that—after some 700,369 trips and 801,887 miles—most residents viewed e-scooters positively. Riders of the 2,043 e-scooters in the program used them primarily as a means to get to a destination (as opposed to recreational excursions), thus demonstrating that at least one of the city's goals—reducing vehicular traffic—was a real possibility. City leaders also learned that improvements were needed to reduce e-scooter-related injuries, illegal sidewalk riding, improper parking, and damage to city park trails (an unwitting violation in most cases).

A second pilot, begun in late April this year, will focus on improving e-scooter accessibility, safety issues, and parking. PBOT also aims to gather more data, especially on e-scooter life-cycle costs and operations, so it can better assess whether e-scooters contribute directly to a reduction in greenhouse gases.

To ensure that the use of e-scooters progresses in a way that supports mobility goals, cities will need to think through several important issues:

- **Rules of the Road.** Governments will play a key role in setting and enforcing the rules of proper e-scooter use, such as prohibiting riding on sidewalks or within pedestrian zones. Equally important is allocating road space. Some cities have already expanded their bicycle pathways and lanes; in others, riders are often forced to share the streets with vehicles, which can aggravate traffic flow and lead to accidents. Riders also need to be educated about the right-of-way rules that apply to e-scooters, and cities need to clearly communicate those rules to riders and the general public.

- **Public Safety.** E-scooter riders generally don't wear helmets or other special protective clothing, which puts them at a certain level of risk. In the absence of special riding zones, the safety of riders, drivers, and pedestrians alike is potentially compromised. A number of accidents and deaths have already been reported; regulators that delay in establishing safety ordinances and public guidelines risk stoking opposition, which could lead to rules that are more restrictive than necessary.

- **Parking and No-Scooter Zones.** Without any kind of municipal planning, e-scooters will end up concentrated in major transit hubs, creating urban clutter. Regulators therefore need to allocate dedicated parking areas for e-scooters as well as establish no-scooter zones to ensure that transit-station exits and commuter pathways are kept clear. This is also important for ensuring unobstructed access for the disabled.

- **Permits and Data Requirements.** State and local governments need to determine what requirements to set for e-scooter providers and how restrictive potential licensing mechanisms should be. To enable better future regulation, governments might make data-sharing agreements a condition of their permitting process. Taxes can be both an important mechanism for controlling e-scooter use and a source of income.

- **Liability.** How should liability be assigned? Governments should explore their own role as well as the roles of e-scooter manufacturers, mobility providers, and individual riders. Mechanisms to ensure that liability claims for accidents are managed fairly and in a timely manner should also be put in place.

By proactively developing policies for e-scooters, cities can ensure that the growth of this promising transportation tool will align with—and help advance—their broader transportation goals.

WILL E-SCOOTERS GAIN traction—or will they crash and burn? Despite their drawbacks, they have the potential to fill an important role in urban mobility at a time when solutions to congestion and pollution are urgently needed. Consolidation will happen, culling many hopefuls from today's crowded field. But providers that do it right—anticipating and mitigating potential conflicts and seeking partnerships with cities and other mobility platforms—could find themselves riding high. And cities that anticipate public concerns and needs by testing, learning, and regulating wisely stand to gain in many ways—not least by making city centers more fun.

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