The background is a solid yellow color. On the right side, there are several architectural drawings. At the top, there is a grid of windows. Below that, there are more detailed drawings of buildings, including a cross-section of a house and a dense urban street scene with various rooflines and structures.

Building *Radical* *Charter Cities*

Paul Healy & Matt Prewitt
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Abstract

Charter cities are special jurisdictions within countries that aim to reduce poverty and spur development via a legal system that differs from that of the host country. Typically, charter cities create legal systems with more reliable enforcement and better incentives for investment and economic development. Charter cities also present a perfect setting to experiment more broadly with economic and democratic reforms at the city level. The RadicalxChange movement—a growing body of literature in economics and law, as well as real-world pilot programs—proposes several policies ripe for implementation in charter cities that aim to reduce concentrations of economic and political power. This paper discusses the theoretical rationales and practical implementation steps for three such policies: (i) SALSA (Self-Assessed Licenses Sold via Auction—a better way to structure property rights), (ii) Quadratic Finance (a better way to fund public goods), and (iii) Quadratic Voting (a better way to vote).

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1. INTRODUCTION

Charter cities, and special economic zones more broadly, have the potential to boost economic growth and foster a spirit of inclusive policy experimentation everywhere in the world. Yet what political and economic principles should guide them?

Even in high-income countries, the shortcomings of traditional systems are increasingly obvious. The United States and its European peers, once considered exemplars of democracy and capitalism, are witnessing unprecedented inequality and political discontent.

Charter cities and special economic zones typically aim to liberalize business laws and enforce contracts more reliably, but they can do much more.¹ Charter cities can improve upon the flawed governance models of developed countries by experimenting with new policy mechanisms. In this paper, we discuss three particular mechanisms that better calibrate the political expression and incentives of those who will benefit or be harmed by particular actions:

- (i) SALSA (Self-Assessed Licenses Sold via Auction, also referred to as Harberger taxation, a better way to tax and allocate property),
- (ii) Quadratic Finance (a better way to fund public goods), and
- (iii) Quadratic Voting (a fairer way to vote).

We focus on policy rationales and implementation steps, providing two in-depth examples for each mechanism. Charter cities present a perfect arena for experimentation with RadicalxChange policy proposals because of their unique legal flexibility. For instance, to take the example of SALSA, the fact that a charter city government can initially own all land in the city means that legal challenges related to the taking of private property will not prevent the implementation of this mechanism. In turn, the RadicalxChange approach can broaden the benefits of charter cities beyond efficiency of commercial laws to new methods of democratic organization.

Across all our mechanisms, we are enthusiastic about large-scale experimentation—within and across cities—so that we can empirically document the benefits (or lack thereof) of these mechanisms. Thus, we recommend the implementation and iteration of RadicalxChange ideas be built into the scale-up strategy for charter cities over the next 5-10 years.

¹ What Is A Charter City?, Charter Cities Institute, <https://www.chartercitiesinstitute.org/intro> (last visited Mar. 27, 2020).

2. SELF-ASSESSED LICENSES SOLD VIA AUCTION (SALSA)

SALSA² (Self-Assessed Licenses Sold via Auction) is a new way to structure property rights for a more dynamic economy. SALSA addresses fundamental problems of monopoly power that arise when individuals hold permanent and absolute entitlements to certain assets (including, but not limited to, land).³

2.1. How it works

SALSA works as follows. Parties bid at an initial auction-style sale and are then given a license conferring ownership of a particular asset. The license holder posts their self-assessed value for the license in a publicly-accessible online marketplace.⁴ The holder pays a periodic fee to the government, as a percentage of their self-assessed value (the “SALSA rate”). New potential holders can purchase a license by simply posting a higher value for the asset in the online marketplace—in this sense, SALSA resembles a continuous auction. (We will discuss step-by-step how to implement SALSA in two charter city contexts below.)

While it might seem that under SALSA a license holder would not make productive investments in the underlying asset if the license could be bought at any moment, this is not true. In fact, they can always protect their investment simply by increasing their valuation, ensuring they will be compensated with a higher price from any buyer. Even better, SALSA increases overall efficiency, counting both investment efficiency and allocative efficiency.⁵

When the SALSA rate is set exactly equal to the “turnover rate” (the probability that a higher-valuing user will in fact buy the asset in a given time period), license holders are perfectly incentivized to value their license honestly (i.e., at their true subjective valuation). For instance, imagine a license is valued at \$100,000 and the turnover rate and the SALSA rate are both 30%. If a holder tries to undervalue their asset by some amount Δ to save on their SALSA payment, they will gain 0.3Δ , but because there is a 30% chance someone will come along and purchase the asset from them, they will also be worse off by 0.3Δ (the lower purchase price received). The same is true if the owner tries to overvalue the asset to get a higher sale price. Since every rational license holder discloses their true subjective valuation, the asset will naturally flow into the possession of its most efficient steward, thus maximizing allocative efficiency.

With a SALSA rate equal to the turnover rate (30% in this example), it is true that some productive investments may be discouraged: for instance, if spending \$75,000 could increase the value by \$100,000, the owner would not make the investment (because it would end up costing them \$105,000 (\$75,000 plus \$30,000 in new SALSA payments on the incremental \$100,000 of valuation). The policymaker in this case can improve investment efficiency by lowering the SALSA rate slightly below the turnover rate. This new, lower SALSA rate trades off a little bit of allocative efficiency for even larger gains in investment efficiency. Allocative efficiency is harmed only marginally when the SALSA rate is set slightly below the turnover rate, because the only transactions thereby precluded are the ones where a putative new holder values the license just slightly more than the current one—but the *most efficiency-increasing* transactions, where the new holder values the asset by much more, will still occur.

2 In the literature, the terms “Harberger taxation,” “COST (Common Ownership Self-assessed Taxation,” and “SALSA (Self-assessed Licenses Sold via Auction)” are used interchangeably. See ERIC POSNER & GLEN WEYL, *RADICAL MARKETS* 55-58 (2018); Paul Healy & Matt Prewitt, *Radical Solutions for Equality and Efficiency in Cities*, OXFORD URBANISTS MAGAZINE (Feb. 12, 2020) (available at: <https://www.oxfordurbanists.com/magazine/2020/1/31/radical-solutions-for-equality-and-efficiency-in-cities>).

3 Eric A. Posner & E. Glen Weyl, *Property Is Only Another Name for Monopoly*, 9 JOURNAL OF LEGAL ANALYSIS 51–123, (Spring 2017); Anthony Zhang & Glen Weyl, *Depreciating Licenses* (unpublished manuscript) (2019) (available at: <https://anthonyleezhang.github.io/pdfs/ownership.pdf>).

4 A quick note to differentiate SALSA from Georgist taxation. In SALSA, the value that license-holders post (and that they ultimately pay the SALSA rate on) is the full, i.e. improved, value of the asset. In contrast to SALSA, a Georgist land tax would tax only the unimproved component of an asset (i.e., the land on which a building stands, excluding the value of the structure itself). In our view, Georgist taxation creates a false, and administratively difficult, distinction between natural and artificial capital. See ERIC POSNER & GLEN WEYL, *RADICAL MARKETS* 40-45 (2018).

5 See ERIC POSNER & GLEN WEYL, *RADICAL MARKETS* 55-58 (2018).

A mirror image of this argument applies when analyzing a SALSA rate of zero (equivalent to fee simple ownership). A SALSA rate marginally higher than zero would permit the most pro-allocative-efficiency transactions to occur (where the new holder values the license far more than the old one) while imposing a *de minimis* burden on the current license holder's investment efficiency. Therefore, a SALSA rate between zero and the turnover rate clearly optimizes for both allocative and investment efficiency.

SALSA thus advances efficiency by striking an optimal balance between facilitating the most efficiency-enhancing transactions, and incentivizing the most efficiency-increasing investments. But it also furthers justice: new entrants with productive ideas can't be blocked by "lazy" license holders, and the considerable revenue from the SALSA fees can fund public goods, services, and infrastructure in perpetuity.

There are three problems that are rampant in cities around the world, which we think SALSA solves especially well.

- i. *Hold-out/assembly problems.* Sometimes a large-scale project requires assembling several assets together in a bundle (e.g., multiple parcels of land needed for a railroad right-of-way). However, once any single asset-holder realizes that a buyer needs to assemble several assets, she can raise the price of her own asset to extract the gains from the potential projects—crucially, one holdout can make a project unprofitable. SALSA solves this problem by allowing instantaneous purchase at self-assessed values.
- ii. *Black markets.* A flat fee for a limited number of assets (i.e., first-come-first-served) runs the risk of corruption and the creation of black markets.⁶ For instance, a 2011 Wall Street Journal article explains that New York City charged \$200 for a two-year food-cart permit license. But the permits fetched tens of thousands of dollars on the black market (revenue could have gone to the city).⁷ SALSA solves this problem because it elicits accurate valuations from market participants. Under SALSA, it's impossible for a public authority to misprice an asset because market participants submit their actual valuations.
- iii. *Lazy monopolists.* Sometimes an asset-holder just doesn't want to sell because to someone who values the asset more, even though they themselves aren't putting it to productive use. Imagine a stall license holder who just never checks her email, and so fails to see that many potential vendors are making high offers to her. SALSA solves this problem by requiring asset-holders to transfer the asset to someone who makes a fair offer.

Historical instances of self-assessment mechanisms

SALSA is not a new invention. For the past several millennia, societies around the world have realized the incentive-compatible benefits of self-assessment.⁸

Ancient Athens. The Ancient Athenians funded public works through a "liturgy" system whereby the wealthiest one thousand citizens—as determined by self-assessment—contributed to the state. If a member of this liturgical class believed someone outside of the class was in fact wealthier, he could challenge the outsider to an "exchange," in which the challenged member would have to either assume liturgical responsibility or trade all his possessions with the challenger.⁹ Thus, all had an incentive to self-assess honestly.

⁶ See generally Chapter 2 in SUSAN ROSE-ACKERMAN & BONNIE J. PAFLIKA, CORRUPTION AND GOVERNMENT: CAUSES, CONSEQUENCES, AND REFORM (2016).

⁷ *Prices for Food-Cart Permits Skyrocket*, WALL STREET JOURNAL (Mar. 9, 2011) (available at: <https://www.wsj.com/articles/SB10001424052748704758904576188523780657688>).

⁸ Most of the examples listed here come from ERIC POSNER & E. GLEN WEYL, RADICAL MARKETS 55-58 (2018).

⁹ DEMOSTHENES, AGAINST PHILLIPUS, discussed in GEORGE C. BITROS & ANASTASIOS D. KAYIANNIS, CREATIVE CRISIS IN DEMOCRACY AND ECONOMY 20 (2013).

Horse racing. In the modern horse-racing system of “claiming stakes,” horse owners who put forward their horse in a given race must be willing to sell the horse for the cost of the race’s prize to anyone willing to buy at that price.¹⁰ Thus, owners of overqualified horses have little incentive to enter them into lower-stakes races against slower horses.

Andorran Fire Insurance. For over a century, communities in Andorra have employed a mutual fire insurance arrangement based on self-assessment, called “La Crema.” In this scheme, individuals declare the value of their property and will receive this amount if their house burns down.¹¹ Accordingly, they contribute into the insurance scheme proportional to their self-declared value. Thus, individuals are incentivized to declare an honest value.

Property taxes and land acquisition. Arnold Harberger first proposed using a self-assessment system in Chile during the 1960s. In order to improve property tax compliance, individuals would pay a tax rate on their self-declared value, but stand ready to sell to any bidder willing to pay the declared value.¹² Similarly, Singapore’s development has been attributed in part to its strong land acquisition powers. Singapore’s Land Acquisition Act of 1966 allowed it to acquire urban land at market price for any public purpose—a power which it used aggressively.¹³

Corporate law. In modern corporate law, the “Texas Shoot Out” method uses self-assessment to resolve deadlocks, in which parties cannot agree on how to allocate in indivisible asset. In this system, the first party declares a price, and then the second party declares “buy” or “sell,” indicating which action the second party wishes to take.¹⁴ Because the party declaring a value doesn’t know whether they will end up buying or selling the asset at their declared value, they have an incentive to declare honestly most of the time.

2.2. Application to charter cities

We see many applications for SALSA in charter cities. One key distinction is between *private assets* (typically land) and *publicly owned or created assets* (typically land or public created licenses to carry on certain activities). In this section, we’ll show how SALSA can enable charter cities to overcome some of the most vexing urban problems in land use and transportation. These two examples, while important in their own right, stand in for the broader categories of private assets and publicly-created assets, respectively.

We recognize that SALSA will be very unfamiliar to most people, even experienced policymakers. Thus, it is imperative for the charter city government to carry out a large-scale campaign of publicity and education so that citizens understand their rationale and possibilities. In addition, in cities where smartphone/internet access is relatively low, an in-person SALSA kiosk at city hall (or several distributed across the city at public transit terminal, for instance) could provide physical access to the online marketplace. We recommend that charter cities look to some of the open source solutions available on GitHub as a starting point to building a practical SALSA license exchange platform.¹⁵

10 Christopher D. Hall, *Market-enforced Information Asymmetry: A Study of Claiming Races*, 44 *ECONOMIC INQUIRY* 271 (1986).

11 Antonio Cabrales et al., *La Crema: A Case Study of Mutual Fire insurance*, 111 *JOURNAL OF POLITICAL ECONOMY* 425 (2003).

12 Arnold C. Harberger, *Issues of Tax Reform in Latin America*, in *FISCAL POLICY FOR ECONOMIC GROWTH IN LATIN AMERICA* (1965).

13 Sock-Yong Phang, *Economic Development and the Distribution of Land Rents in Singapore: A Georgist Implementation*, 55 *AMERICAN JOURNAL OF ECONOMICS & SOCIOLOGY* 491-94 (Oct., 1996) (describing Singapore’s land value capture system).

14 Coursera, Texas Shoot Out, Introduction to Negotiation: A Strategic Playbook for Becoming a Principled and Persuasive Negotiator (visited Feb. 9, 2020), <https://www.coursera.org/lecture/negotiation/texas-shoot-out-wHpr6>; Abhinav Rastogi, Deadlock Resolution Mechanism in Joint Venture Agreements, Mondaq.com (visited Feb. 9, 2020), <https://www.mondaq.com/india/CorporateCommercial-Law/635334/Deadlock-Resolution-Mechanism-In-Joint-Venture-Agreements>.

15 See., e.g., Harberger-Taxes-Contract-Wrapper, Github, <https://github.com/carboclan/Harberger-Taxes-Contract-Wrapper> (last visited Apr. 16, 2020); costland, Github, <https://github.com/eordano/costland> (last visited Apr. 16, 2020).

Land use—beyond private ownership

Private ownership of land inhibits allocative efficiency because of holdout problems in land assembly and “lazy monopolist” problems discussed above. To address these problems, charter cities can use the following step-by-step process to implement SALSA on private commercial and residential land.

Step 1a—Land acquisition. Charter city acquires land from host government. (Prior steps, involving government acquisition and ownership of land are outside the scope of the current paper.)

Step 1b—Rate structure. Charter city passes legislation describing the rate structure for fees (analogous to property tax rate ordinances, traditionally passed annually by local governments). The rate should theoretically be set at the “turnover rate” (the probability that a new, interested buyer comes along in the relevant time period), adjusted downward for investment efficiency. Cities should aim to discover this rate by trial and error, erring on the side of setting a SALSA rate that is slightly too low rather than too high.

Step 1c—Surrender time, inspection, and other rules. Charter city sets rules for how long a SALSA license holder may remain in possession of the asset after a new holder has purchased the license from them. This may vary depending on the characteristics of the asset; or it may be appropriate to allow license holders to pay a slightly higher fee, over and above the SALSA rate, for a longer guaranteed surrender time. Charter city must also set rules permitting would-be license buyers to arrange for reasonable inspections of assets (and preventing last-minute changes to self-assessments in response to inspection requests); and may also wish to set limits on license-holder “bundling.”

Step 2—Land sale. Charter city leases plots of land to commercial developers through an online exchange system which lists each plot. All leases include a SALSA term in each lease that reads as follows:

<“SALSA. SALSA-holder remains the lessee of this plot for such time as SALSA-holder maintains the largest financial value for this plot in the Online Exchange [defined elsewhere in the lease]. At such time as SALSA-holder no longer maintains the largest financial value, he shall transfer this lease to the person whose identity is associated with the largest financial valuation.”>

The plots are allocated to buyers in an initial auction, and subsequently exchanged through the SALSA mechanism.

Step 3—Land exchange. Land owners continue on making exchanges in the online marketplace.

Evaluation

SALSA purports to improve allocative efficiency and transform private rents into public wealth. Thus, charter cities should seek to evaluate the efficacy of SALSA on these two dimensions. For instance, the Charter Cities Institute could evaluate the performance of charter cities against a synthetic control group, comparing treated charter cities to similarly situated, but untreated urban regions which exhibit similar pre-policy trends.¹⁶ An evaluator should observe the following outcomes variables:

Allocative efficiency—property values; property turnover rate, in particular value increase upon turnover.

Transforming private rents to public wealth and dynamism—public revenue per capita; new business entry; price-cost margins in consumers good and residential/commercial rental prices.

¹⁶ Robert McClelland & Sarah Gault, *The Synthetic Control Method as a Tool to Understand State Policy*, URBAN INSTITUTE (Mar. 2017) (available at: https://www.urban.org/sites/default/files/publication/89246/the_synthetic_control_method_as_a_tool_0.pdf).

Transportation—beyond congestion pricing

Transportation congestion is one of the most serious urban problems worldwide. Cities in developing countries struggle in particular. According to GPS company TomTom’s “congestion index,”¹⁷ the top sixteen most congested cities in the world are in developing countries and four of the top ten are in India alone.¹⁸

Jurisdictions around the world have tried many approaches to mitigate congestion, including congestion pricing and restricting the use of vehicles with top-down quotas or lotteries for vehicle licenses. Our proposed policy is a “SALSA plus dynamic cap.”¹⁹ We’ll first sketch out how charter cities could use this mechanism to attack congestion and then describe its advantages over other approaches. We think SALSA plus dynamic cap should be adopted not just for road use, but for any other urban problems where the economics of congestion externalities pose a problem (bike sharing, e-scooters, and so on).

Step 1—The city releases a certain number of “vehicle use licenses” in the online exchange. Potential vehicles users purchase these licenses via auction and subsequently pay a fee on their self-assessed value, as is typical in a SALSA. The city can offer categories of licenses (“peak,” “non-peak,” and so on) that correspond to different times of day in order to better distribute road usage across peak and non-peak commute times.

Step 2—The city monitors its congestion levels (e.g., average travel speeds during rush hour or some other measure of the dispersion between travel speeds measured at different points during the day). If the city determines that congestion levels are below some acceptable threshold (i.e., the city is not very congested), it releases a quantity of new licenses onto the exchange. If the city determines that congestion levels are above some acceptable threshold (i.e., the city is congested), the city buys up some quantity of licenses at their self-assessed values on the exchange. The city should buy the lowest-valued license first. If all licenses have the same value, the city should randomly choose the licenses to purchase.

This approach to congestion will likely lead to the most environmentally efficient types of transportation. Because a large bus or a shared ride vehicle can transport many more people than a single-rider car, owners of those vehicles (including rideshare companies) will be willing to pay much more for a license. Evidence from London’s cordon pricing effort provides suggestive support for this proposition: when faced with a congestion charge for individual car use, Londoners preferred to take relatively cheaper public transport.²⁰ Similarly, when faced with a hard vehicle quota, residents of Beijing have flocked to ride-sharing.

A concern about social equity naturally arises. How does our intended scheme comport with principles of public transportation? Will auctioning off road space lead to a lack of mobility options for low-income residents, while high-income residents whizz by? The short answer is no. The idea is to get everyone who can afford to pay for the negative externalities of their public resource use to actually do so—not to give them privileged access.

First, as suggested above, without any market intervention, it is likely that larger, shared modes of transport will value licenses quite highly (e.g., a large bus which can transport 100 passengers per hour for \$1 each will easily outbid an affluent businessperson who would pay up to \$100 per day for the privilege of individual car use whenever she wants it). Next, the city could provide demand-side subsidies or vouchers (e.g.,

17 The index compares how much longer drivers spend in traffic during peak times versus uncongested, “free flow,” times. See About Our Methodology, TomTom.com (last visited Feb. 20, 2020), https://www.tomtom.com/en_gb/traffic-index/about/.

18 Traffic Index 2019, TomTom (2019) (available at: https://www.tomtom.com/en_gb/traffic-index/ranking/).

19 This section draws from Ash Milton, COST as Cure for Car Dependency, RadicalxChange Blog (Jun. 7, 2019), <https://www.radicalxchange.org/blog/posts/2019-06-07-z6cxo7/>; and Matt Prewitt & Paul Healy, The Handbook for Radical Local Democracy 32-33, RadicalxChange Foundation (2019) (available at: <https://www.radicalxchange.org/wp-content/uploads/2020/02/The-Handbook-for-Radical-Local-Democracy.pdf>).

20 Irene Garcia Perez, \$15 A Day To Drive? Londoners Say ‘Thanks, I’ll Take The Train’, BLOOMBERG BUSINESSWEEK (Feb. 28, 2019) (available at: <https://www.bloomberg.com/news/articles/2019-02-28/london-s-congestion-charge-has-cut-traffic-by-30-percent>).

low-income residents receive \$50 per month of transportation benefits, which they can use freely). Many cities currently employ this approach with transit fare reductions.²¹ Finally, the city could provide a certain amount of affordable (even free) public transport routes to qualified parties, which are exempt from the entire exchange. Crucially, the revenue from the system can and should be used to fund such programs, or substitute public goods including public transit.

Our policy has clear advantages over current approaches. Here we will summarize current approaches to congestion and then discuss the advantages of SALSA.

Vehicle quotas with one-time auctions. In some cities, vehicle owners bid in an auction for a vehicle license, which they then own for some set period of time. For instance, in Singapore, vehicle owners who win the auction get a license for ten years.

Vehicle quotas with lotteries. Same as above, but winners are chosen randomly through a lottery. Beijing uses this method.²²

Cordon pricing. Vehicle owners pay a fee to enter a congested zone (typically a downtown business district in a big city), which they can then remain inside of as long as they want. In New York City and Stockholm, two of the highest-profile cities to institute cordon pricing, the prices have been set in advance by the legislature, rather than updated in real time in response to traffic.²³

Dynamic tolling. Dynamic tolling is like cordon pricing, except users pay a fee (which adjusts dynamically to maintain an optimal road speed) to drive on a particular road, usually a highway entering into a big city. The U.S. state of Virginia uses this system on the Interstate 66 (which goes from northern Virginia into Washington, D.C.).²⁴ The toll recalculates every six minutes to maintain a minimum road speed of 45 miles per hour. Vehicles with more than one occupant are exempted from the toll, in an effort to encourage carpooling.

Relative to current approaches, SALSA promotes allocative efficiency and prevents the creation and extraction of private rents. The advantages of SALSA lie in its compelled exchange and license quota that adjusts in response to congestion. The compelled exchange ensures that “lazy” monopolists cannot inhibit social efficiency. The adjusting license quota ensures that excess demand does not create the opportunity for private rents in a black market.

A quota with auction allocates road space to those who value it most at an initial point in time, but then creates private market power subsequently. If license-holders are not compelled to sell, the “lazy” license holders will inhibit social efficiency. Furthermore, even if license holders do make an exchange, the initial license holders will capture private wealth that could have gone to the public.

A quota with lottery clearly does not allocate road space to those who value it most. Even if users can exchange their licenses subsequently, they are likely to capture private wealth from the public’s policy failure, insofar as the quota creates private profit margins for lottery winners (like the example of a black market for food cart licenses in New York City, above).

21 See, e.g., New York City’s “Fair Fares” program. Fair Fares NYC (last visited Feb. 20, 2020), <https://www1.nyc.gov/site/fairfares/index.page>.

22 Yan Zhang, *In Beijing, You Have to Win a License Lottery to Buy a New Car*, BLOOMBERG BUSINESSWEEK (Feb. 27, 2019) (available at: <https://www.bloomberg.com/news/articles/2019-02-27/in-beijing-you-have-to-win-a-license-lottery-to-buy-a-new-car>).

23 Winnie Hu, *What is Congestion Pricing?*, NEW YORK TIMES (Apr. 24, 2019) (available at: <https://www.nytimes.com/2019/04/24/nyregion/what-is-congestion-pricing.html>); Jonas Eliasson, *Stockholm’s Congestion Pricing, Tools of Change* (Oct. 2014), <https://www.toolsofchange.com/userfiles/Stockholm%20Congestion%20Pricing%20-%20FINAL%202014.pdf>.

24 David Schaper, *Are \$40 Toll Roads The Future?*, NPR (Dec. 12, 2017) (available at: <https://www.npr.org/2017/12/12/570248568/are-40-toll-roads-the-future>).

Cordon pricing similarly does not encourage allocative efficiency insofar as its prices are set legislatively (rather than responding to market conditions) and because once inside of the cordon-priced area, car users are not incentivized or compelled to *leave* the area for other, newer users who may value the space more at a new time.

Dynamic tolling is the best current approach in our view. However, it's best suited for highway-style transportation corridors, where car users will proceed from entry to exit points over the course of their commute. Within an urban area, this style of corridor dynamic pricing simply won't work, because car users are not merely passing through, they want to perform various activities within the urban zone. This kind of use calls for a dynamically adjusting price where car users are compelled to give up space to those who value it more—SALSA accomplishes these goals elegantly.

What to do with SALSA revenues

As a general principle, SALSA revenues should be redistributed to address positive or negative externalities stemming from the use of the asset subject to SALSA. Two brief examples can illustrate this principle.

When positive externalities are present, SALSA revenue can subsidize the socially beneficial activity associated with the asset. In our first example above (using SALSA for commercial land), the productive value of urban land exhibits positive agglomeration externalities. Because individuals will not take into account these positive externalities in their own locational decisions, a city should use SALSA revenues to pay potential residents to move in, thus increasing the density and agglomeration economies of the city.

Our second example above (congestion pricing), can illustrate this principle with negative externalities. In a city using SALSA for congestion pricing, transfer payments with SALSA revenue should be made to those residents who can afford to purchase a vehicle but cannot afford a SALSA road use permit—in effect, these are the individuals who *could* have used the road in a non-SALSA scenario. In this sense, when negative externalities are present, SALSA revenues can be used to make the shift from non-SALSA to SALSA Pareto efficient, rather than merely Kaldor-Hicks efficient.

Evaluation

Key outcomes include:

Travel speeds. Measuring free flow traffic speeds on certain main roads at different times of day. As mentioned above, a comparison of off-peak to peak travel speeds is a standard measure of a city's congestion burden.

Commute times for a random sample of urban residents. This would capture the distributional effects of the Harbgerger tax system. For instance, if some middle-class residents are priced out of single car ownership, but shift to shared-ride vehicles, we can observe their new commute times. Observing this outcomes across the income and occupation distribution will give a truer measure of the policy's welfare effects than simple travel speeds.

3. QUADRATIC FINANCE (QF)

The funding of public goods is a foundational problem in public policy, especially for local governments. Because such goods are non-rivalrous and nonexcludable (e.g., local security, clean air, street lights), citizens will pay less for them than they actually value them, preferring to “free ride” on the contributions of others. Quadratic Finance is a new way to fund public goods that uses voluntary contributions paired with a public matching fund to provide the socially optimal amount of each good.

3.1. How it works

A 2018 paper by Vitalik Buterin, Zoe Hitzig, and Glen Weyl proposed Quadratic Finance, a new mechanism design for funding public goods.²⁵ Alex Tabarrok, on the popular economics blog *Marginal Revolution*, called this idea “quite amazing and a quantum leap in public-goods mechanism design.”²⁶ Put simply, QF uses a new kind of funding formula to solve both the “information problem” (the government may not know how much of a certain good to provide) and the “free rider” problem (individuals contribute less than their willingness to pay) inherent in many public good situations. In solving the information problem, QF measures the extent to which the benefits of a public good actually inure to the public. Projects that have highly concentrated support are likeliest to have hidden dimensions of rivalry or excludability: for instance, a public park will have broader support if many residents live in proximity to the park than if a single land-owner owns all the surrounding property.

QF works based on a formula that may seem complicated, but is not. Here is how it works.

Total funding for project p is calculated by summing the square roots of each citizen i 's (voluntary) contribution c_i , and then squaring that sum:

$$Funding_p = \left(\sum_i \sqrt{c_i^p} \right)^2$$

The difference between the total funding calculated and the sum of the individual contributions made is made up by a matching fund of public revenues:

$$Matching_p = \left(\sum_i \sqrt{c_i^p} \right)^2 - \sum_i c_i$$

Step 1—Total funding. To find a project's total funding, sum the square roots of private contributions and then square it. The result of this formula is that proposals with few contributors get little or no match, while proposals with many contributors get large matches.

Step 2—Matching fund. Because the total funding found in step 1 will exceed the private contributions made (as long as more than one person has contributed), subtract the private contributions from the total to find the match required from the QF matching fund. (We recommend that the matching fund itself come from the fees collected by the government through the SALSA mechanism discussed above.)

Figure 1 below illustrates this process with an example where three citizens make contributions for three potential public projects. As you can see in the figure, the largest match goes to the “fix streets” option because it is the most widely supported.

25 Vitalik Buterin, Zoe Hitzig & Eric Glen Weyl, *Liberal Radicalism: A Flexible Design For Philanthropic Matching Funds* (unpublished manuscript) (Dec. 2018) (available at: <https://ssrn.com/abstract=3243656>)

26 Alex Tabarrok, *The Liberal Radicalism Mechanism for Producing Public Goods*, *Marginal Revolution* (Sep 27, 2018), <https://marginalrevolution.com/marginalrevolution/2018/09/liberal-radicalism-mechanism-producing-public-goods.html>.

	Fix streets	Build playground	Improve cell coverage
Citizen			
A	\$ 9	\$ 1	\$ 1
B	\$ 1	\$ -	\$ 64
C	\$ 4	\$ 16	\$ -
Funding amount	\$ 36	\$ 25	\$ 81
Total pledged	\$ 14	\$ 17	\$ 65
Match required	\$ 22	\$ 8	\$ 16

1 Add the square roots of the contributions, then square to get the total funding amount.

2 Subtract the total funds pledged to find the match needed.

Figure 1: QF Example

Figure 2 below further illustrates the pro-democratic nature of QF. In this example there are 25 citizens contributing to three potential projects. Although the privately-made contributions sum to \$200 for each of the projects, Project A receives the largest match by far because it is the most widely shared preference.

Citizen	Project			
	A	B	C	
1	\$ 10	\$ 20	\$ 100	100
2	\$ 10	\$ 20	\$ 100	100
3	\$ 10	\$ 20	\$ -	-
4	\$ 10	\$ 20	\$ -	-
5	\$ 10	\$ 20	\$ -	-
6	\$ 10	\$ 20	\$ -	-
7	\$ 10	\$ 20	\$ -	-
8	\$ 10	\$ 20	\$ -	-
9	\$ 10	\$ 20	\$ -	-
10	\$ 10	\$ 20	\$ -	-
11	\$ 10	\$ -	\$ -	-
12	\$ 10	\$ -	\$ -	-
13	\$ 10	\$ -	\$ -	-
14	\$ 10	\$ -	\$ -	-
15	\$ 10	\$ -	\$ -	-
16	\$ 10	\$ -	\$ -	-
17	\$ 10	\$ -	\$ -	-
18	\$ 10	\$ -	\$ -	-
19	\$ 10	\$ -	\$ -	-
20	\$ 10	\$ -	\$ -	-
21	\$ -	\$ -	\$ -	-
22	\$ -	\$ -	\$ -	-
23	\$ -	\$ -	\$ -	-
24	\$ -	\$ -	\$ -	-
25	\$ -	\$ -	\$ -	-
Funding amount	\$ 4,000	\$ 2,000	\$ 400	
Total pledged	\$ 200	\$ 200	\$ 200	
Match required	\$ 3,800	\$ 1,800	\$ 200	

Figure 2: QF Example with 25 Contributors

Three final notes on the limitations of QF, before we move on to applications. First, policymakers should not initially use QF to allocate vital funding to essential services. Until more empirical data exists on QF outcomes, it should not be presumed that the process will result in adequate funding for indispensable services whose costs are usually opaque to the public, such as public safety or infrastructure maintenance. However, QF can and should initially be used to allocate funds for more discretionary goods, like public amenities (parks, bike paths, public events).

Next, QF assumes that citizens are not colluding by, for example, giving their money to friends to contribute “independently,” thus increasing the public match. This should be considered fraud, just as buying votes is fraud in any public election. If it cannot otherwise be enforced, the QF algorithm may be modified to increase the difficulty and reduce the efficacy of collusive strategies, for example by suppressing the possible public match to each pair (or trio, etc.) of voters by an amount proportional to the correlated-ness of their contributions, or some other indicator of the contributors’ non independence. Public QF experiments have already successfully implemented such anti-collusive modifications.²⁷

27 See, e.g., Vitalik Buterin, Review of Bitcoin Quadratic Funding Round 3 (last visited Apr. 16, 2020), <https://vitalik.ca/general/2019/10/24/gitcoin.html>.

Finally, QF does not itself say anything about the geographic scope within which goods are funded and provided. This dimension (sometimes referred to as the “fiscal unit”²⁸) is assumed to be established before the QF process. Thus, policymakers need to decide which goods are funded at the neighborhood level versus city level (or some broader levels), taking into account coordination problems and externalities inherent in the goods themselves and preferences for spatial redistribution. To take just one example, highly localized land use decisions at the neighborhood level have constrained housing supply in the United States.²⁹ Charter city policymakers must be on guard for similar situations and adjust the scope of QF accordingly.

Tools for implementing QF in the municipal context are likely to be ready sometime in late 2020 through our technology partners.

3.2. Application to charter cities

We think that QF can improve upon current funding methods in any setting where a city wants to elicit participant preferences about specific dollar amounts (e.g., participatory budgeting) or wants to administer a public matching fund for a particular purpose. Generally, we are excited about the application of QF for public election matching funds, participatory budgeting, and other group funding decisions. Here are two particular examples that we think are well-suited for charter cities.

Discretionary public works investments. The following QF matching process could be used to fund public works projects in a way that is more democratic and less present-biased than current funding schemes. The pool of “QF contributors” in this process would consist of all citizens.

Step 1—Project proposal phase. QF contributors can submit project proposals and vote on each others proposals (using QV) in an online system. This stage of the process would mirror the government of Taiwan’s Presidential Hackathon.³⁰ Then, infrastructure planners in the city go through the list of leading vote-getters to ensure compatibility (e.g., the city should not allow QF to fund both “expand the dam” and “close the dam” projects).

Step 2—QF. Contributors can allocate their own funds among the projects available and receive matches according to QF.

Step 3—Fund Projects. All projects that receive total funding above the level that makes them viable proceed.

This approach would improve significantly upon current approaches to including “local voice” in public works projects. Currently, cities receive citizen input in an undisciplined way that allows a few loud voices to have their preferences served (whether in terms of the projects that do get built or in blocking projects from happening at all).³¹ By enabling large matches for widely-supported projects, QF makes it very costly for a small group of individuals to have their preferred project supersede the majority’s preference.

Campaign finance. A matching fund can subsidize candidates’ campaigns for office. The quadratic financing mechanism would ensure that candidates with a very narrow base of support—such as those with a small number of wealthy backers—would receive minimal public support.

28 Brian Highsmith, *The Implications of Inequality for Fiscal Federalism (or Why the Federal Government Should Pay for Local Public Schools)*, 67 BUFFALO LAW REVIEW 407 (2019).

29 See, e.g., David Schleicher, *City Unplanning*, 122 YALE LAW JOURNAL 1670 (2013).

30 Presidential Hackathon, Taiwan.gov (last visited Feb. 28, 2020), <https://presidential-hackathon.taiwan.gov.tw/en/>.

31 See, e.g., Patrick Sisson, *Public Meetings Are Broken: Here’s How to Fix Them*, CURBED (Feb. 12, 2020) (available at: <https://www.curbed.com/2020/2/12/21132190/neighborhood-development-democracy-city-council-local-meeting>).

Step 1—Candidates register to run for office. Before any funding is disbursed through QF, candidates must acquire a certain number of signatures to get on the ballot for a particular office.

Step 2—Repeated time windows for QF matching. Within each pre-set window of time (e.g., one month) a certain amount QF funding is released for matching. At the end of each month, matches are disbursed to candidates. This step ensures that an initial burst of widespread support cannot create an unstoppable cycle of momentum for any one candidate. Candidates must have repeated, widespread support to continue unlocking large matches.

Step 3—Elections. The jurisdiction holds elections. If appropriate, the use of Quadratic Voting may further enhance the quality of elections (see next section).

The process outlined above would be superior to the most common types of public election matching already in use because its matching mechanism comes from an optimized process. In contrast, current and proposed matching schemes seem to use arbitrarily chosen numbers. For instance, New York City’s public election matching fund uses an 8-to-1 match with match caps for each contribution—there seems to be no principled justification for this formula.³² Similarly, United States Senator Elizabeth Warren has proposed a federal matching fund that would match 6-to-1 contributions less than \$200—again, these criteria do not stem from any principled source.³³

Evaluation

Key outcomes include:

Public good provision. Labor productivity, infrastructure “grade” (i.e., state of repair), property values.

Engagement/trust in government. Self-reported trust in local government, optimism about local government.

4. QUADRATIC VOTING (QV)

Quadratic voting is a new way to vote that allows voters to express the intensity of their preferences.³⁴ Rather than each person having a “yes/no” vote (referred to as “one-person-one-vote” or “1p1v”), voters can allocate “voice credits” across multiple options available. This matters because it overcomes the tyranny of the majority, which occurs in 1p1v when a large majority who only slightly prefer a certain option drown out a small minority who *really* prefer another option.

4.1. How it works

In quadratic voting, voters allocate their credits across all options available, with a quadratic cost to piling the credits on one option. Two votes? That’ll be four voice credits. Three votes? Nine voice credits. And so on. The research underlying this idea shows that that quadratic (square) cost is the only one that produces societally optimal results.³⁵

32 New York City Campaign Finance Board, Join the Matching Funds Program (last visited March 27, 2020), <https://www.nycffb.info/candidate-services/join/>.

33 Elizabeth Warren, Getting Big Money Out of Politics (last visited March 27, 2020), <https://elizabethwarren.com/plans/campaign-finance-reform>.

34 Steven Lalley & Eric Glen Weyl, *Quadratic Voting: How Mechanism Design Can Radicalize Democracy* (Dec 24, 2017), 1 AMERICAN ECONOMIC ASSOCIATION PAPERS AND PROCEEDINGS 1.

Votes	Voice Credit Cost
1	1
2	4
3	9
4	16
5	25
6	36
7	49
8	64
9	81
10	100

Figure 3: QV Example

The following two examples in the figure below show how QV, by eliciting much richer information from voters than traditional one-person one-vote, can reduce polarization and avoid the classic “tyranny of the majority.”

Quadratic Voting



Avoids the tyranny of the majority.

Quadratic Voting (QV)							One-person one vote (1P1V)			
Person 1	Person 2	Person 3	Total votes	Person 1	Person 2	Person 3	Total votes			
Credits	Credits	Credits		Person 1	Person 2	Person 3				
100.0	10.0	3.2	16.3	1.0			1.0			
-	20.0	4.5	8.9							
-	30.0	5.5	11.0							
-	40.0	6.3	12.6		1.0	1.0	2.0	Winner		
100.0	10.0	100.0	19.4	100.0	19.4	1.0	1.0	1.0		

Decreases polarization.

Quadratic Voting (QV)							One-person one vote (1P1V)			
Person 1	Person 2	Person 3	Total votes	Person 1	Person 2	Person 3	Total votes			
Credits	Credits	Credits		Person 1	Person 2	Person 3				
50.0	7.1	50.0	14.1	1.0			2.0	Winner		
30.0	5.5	4.5	15.4			1.0				
20.0	4.5	5.5	14.4							
-	50.0	7.1	7.1		1.0		1.0			
100.0	17.0	100.0	17.0	100.0	17.0	1.0	1.0	1.0		

RadicalxChange Fondation

Figure 4: Benefits of QV

A growing body of academic work and real-world use cases³⁶ indicate that quadratic voting captures more precise and useable information than simple voting. QV also furthers equality and dignity by giving small minorities with strong preferences a possibility of prevailing democratically against an apathetic majority.

We have begun testing out QV in the real world. For example, in 2019 the Democratic Caucus of the Colorado House of Representatives successfully used quadratic voting to decide which spending bills to prioritize.³⁷ The experiment was a success, and cutting-edge institutions all over the world are now adopting quadratic voting for both internal and public decision-making processes.³⁸

35 Essentially, a quadratic cost is the only one that charges voters a price that increases proportional to the externality they impose on others by demanding more or less of a public good, because this externality (or “deadweight loss” in a classic supply and demand diagram) is proportional to the square of the voter’s quantity demanded. For more on this assumption, see ERIC POSNER & GLEN WEYL, RADICAL MARKETS 97-105 (2018); Jon X. Eguia Nicole Immorlica, Katrina Ligett, Eric Glen Weyl & Dimitrios Xefteris, A New Consensus Protocol: Quadratic Voting With Multiple Alternatives (unpublished manuscript) (April 4, 2019) (available at: https://en.wikipedia.org/wiki/Quadratic_voting).

36 See Wikipedia for a partial list of examples. Quadratic Voting (last visited Apr. 16, 2020), https://en.wikipedia.org/wiki/Quadratic_voting.

37 See, e.g., Peter Coy, A New Way of Voting That Makes Zealotry Expensive, BLOOMBERG BUSINESSWEEK (May 1, 2019), <https://www.bloomberg.com/news/articles/2019-05-01/a-new-way-of-voting-that-makes-zealotry-expensive>.

38 E.g., Official site of the Taiwan’s 2019 Presidential Hackathon <https://presidential-hackathon.taiwan.gov.tw/en/>.

We have several partners around the world who are creating and already implementing QV: Polco (U.S.), Democracy Earth (worldwide). For the “menu generation” step before the voting process, organizations like CrowdLaw³⁹ and pol.is⁴⁰ offer technologies for sourcing citizens’ ideas and opinions in a structured way.

4.2. Application to charter cities

QV is best suited for two particular settings in charter cities: (i) internal committee (non-citizen-facing) decisions made by government bodies or business associations in the charter city, and (ii) citizen-facing, democratic elections of government leaders.

Internal/committee decisions

When a decision is not amenable to small-group conversation and consensus building, QV generally provides the next-best alternative. For instance, the Colorado Democratic Caucus in the United States recently used QV to prioritize among spending bills. Charter city governing bodies can use QV for similar internal funding allocation or prioritization exercises. Members of a governing body can allocate credits and engage in QV to express their preferences on how the committee should prioritize its resources. The diagram below shows how the Colorado legislative body used QV to prioritize among potential pieces of legislation.

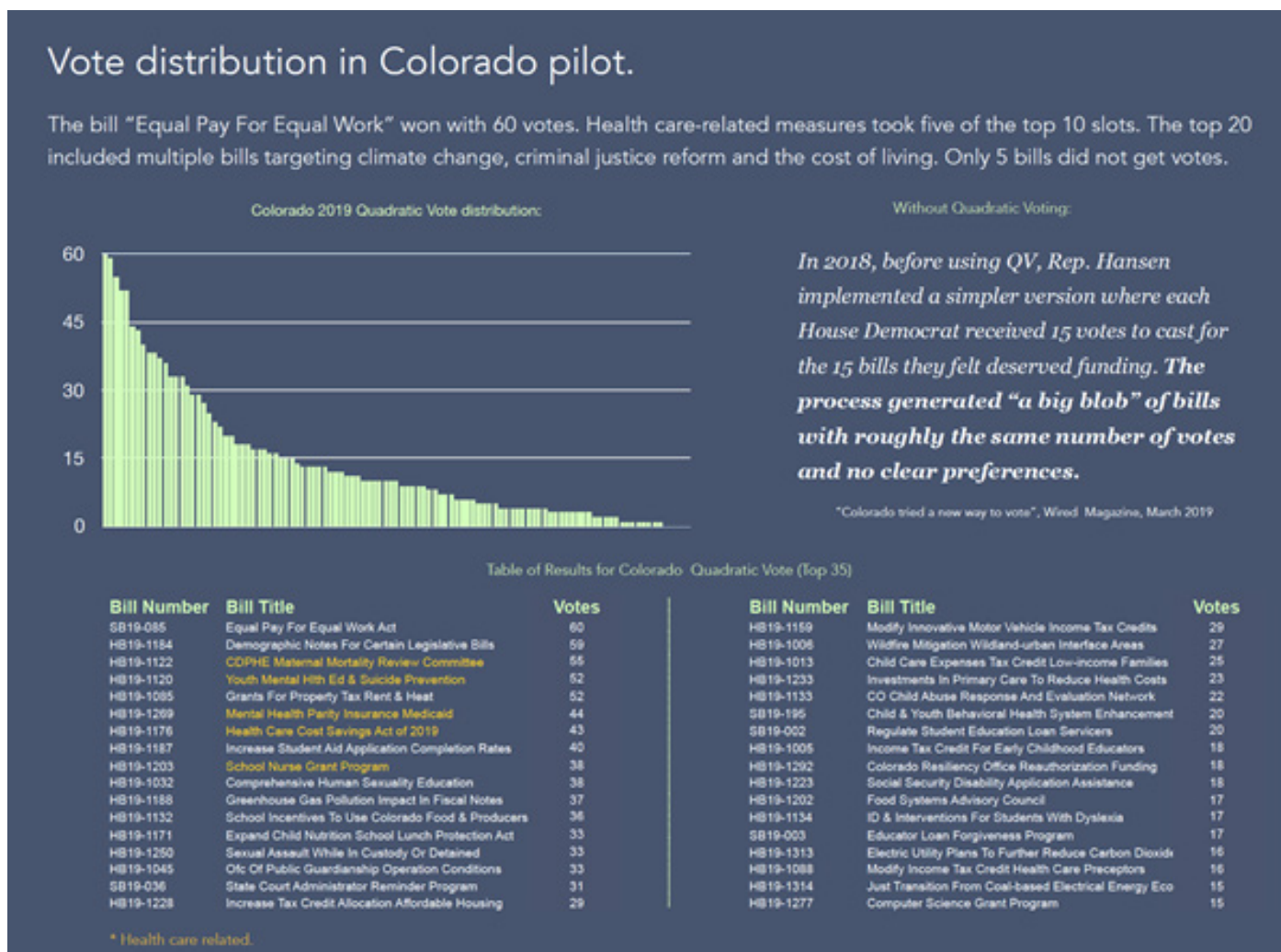


Figure 5: Colorado QV example

39 CrowdLaw (last visited Mar. 9, 2020), <https://crowd.law/crowdlaw-for-congress-strategies-for-21st-century-lawmaking-6f3a82d3a0b1>.

40 Pol.is (last visited Mar. 9, 2020), <https://pol.is/home>.

Citizen-facing, democratic applications

For citizen-facing applications, cities will want to be a little bit more careful. Because voter turnout and the selection of exactly which options are on the “menu” will determine outcomes, QV is best for high-turnout, fixed-menu settings. For example, a mayoral race with many candidates and one winner would be well-served by QV. In this case, the mayoral election would proceed as normal, except that voters would allocate credits and engage in QV instead of simply voting for one candidate at the poll. As the illustration below shows, voters can allocate their credits for or against each candidate—this allows for a wide range of preferences to be expressed. If voters’ credits do not sum to 100 (or whatever total amount they are assigned), then the vote-counting authority should simply scale down (or up) their credits proportionally. The diagram below shows how a mayoral election ballot might look under QV.

	One-person-one-vote	QV	
		For	Against
Candidate A		0	30
Candidate B	X	50	0
Candidate C		20	0
Candidate D		0	0

Figure 6: QV application to local election

Evaluation

Key outcomes include:

De-polarization. A comparison across cities of how polarized their elected officials and policies are.

Representation. A survey of citizens stated preferences (and their intensities) versus the views and subsequent policy actions of candidates who actually get elected, or policies that actually get enacted.

5. CONCLUSION

This paper has discussed three mechanisms—SALSA, QF, and QV—which all share the common aim of decreasing concentrations of power that distort markets and political activity. We think that charter cities represent the perfect testing ground for these mechanisms. After successful implementation in charter cities, as laid out in this article, the policies can be tweaked and rolled out at more regional and national levels. Charter cities should not repeat the policy mistakes that have led to economic concentration and democratic gridlock in so much of the developed world—a more dynamic and democratic future awaits.