**Introduction**

Originated from several European grass-root movements, the concepts of energy democracy and re-municipalization has disseminated to the U.S. Re-municipalization refers to a process that shifting the power of energy decision-making from previously privatized energy corporations to local governments. This process is deemed as a method to achieve energy democracy, as citizens are able to influence the local governments through voting in western democracies.

Being a demonstration of the re-municipalization process, community choice aggregation (also known as municipal aggregation/governmental aggregation/electrical aggregation) has been getting its popularity within recent decades. CCA program is a community choice that local governments automatically enroll potential residential and small commercial customers in their jurisdictional territories. If the customers do not opt-out from the program, then CCAs will aggregate their energy demand loads and negotiate with suppliers for lower prices and more renewable sources. The boards of CCAs are formed by elected officials from the local governments, which means public inputs are more valued by them than by the private corporations.

Nowadays, there have been 10 states adopted a CCA authorizing legislation, all of them deregulated or half-deregulated their energy markets. Deregulation makes CCA program competitive since it opens the market to alternative retail energy suppliers, and they can be suppliers to CCAs. Except the states of Maryland, Rhode Island, Virginia and New Hampshire, the other six states (California, Massachusetts, Illinois, Ohio, New York, New Jersey) have implemented the program to serve residential and small-business consumers for several years.

This dissertation is exploring formation, effectiveness and unintended consequences of CCA program U.S. states. Understanding the mechanism of CCA adoption provides insights to energy policy design and dissemination. Meanwhile, results of the assessment on whether or not CCA program has achieved its expected outcomes is informational to policy makers, which helps them make further policy decisions. For many policy makers, policy success is an important indicator for them while deciding on policy actions like adoption, adjustment and termination. Besides knowing if the program has achieved its expected goals, realizing the unintended consequences of CCA program is also critical for policy improvements. Some negative impacts need to be addressed for the long-run program development.

There are three papers in this dissertation. The first paper studies the relationship between citizen ideology, government institutions, and CCA initiation and adoption in Illinois and California. Then, the second paper elaborates the expected outcomes of CCA program, and it evaluated whether the program has achieved one of the outcomes-local control over energy sources. Finally, the third paper discovers if CCA program has negatively impacted investor-owned-utilities (IOUs) that serve CCA service areas.

**Paper I: Community Choice Aggregation in the U.S.: Political Markets, Citizen Ideology, and Institutions**

**Political Market Framework and Public Policy Demand**

As of 2021, more than 700 local governments in Illinois have adopted CCA program. At the same time, about 150 local governments in California also formulated their CCAs. While these communities chose to adopt the program, many others did not. This paper explores why there is this difference regarding CCA adoption among those communities.

Understanding formation of CCA program is helpful for policy makers to identify potential adopters. At the same time, the finding can provide insights to CCA program design in the future. Moreover, the overall energy policy making can also learn from the experience of CCA adoption, in terms of policy design and tactics for policy dissemination.

Several policy adoption scholars have utilized a political market framework to assess the adoption mechanism of policies. According to the framework, there is a demand side and a supply side of public policies. On the demand side, citizens and interest groups demonstrate their policy preferences. Some studies concluded that the preferences were shaped by different factors, such as community attributes, citizen characteristics and the business types that interests groups were engaged in. Receiving the preferences, governments on the supply side will respond to the preferences by making a decision on whether or not to adopt a specific policy.

Later, some scholars proposed a more complicated political framework that includes not only the demand and supply aspects, but it also put forward the existence of mediators in the middle of those two sides. As they claimed, mediators like government institutions could determine the responsiveness of government supply of policy to the public policy preferences.

**Citizen Ideology Shapes Public Policy Demand**

Among the factors that shaping the public policy preferences, citizen ideology is definitely a powerful one. Several studies on environmental policy adoption show that the ideology influence how people perceive the problem and the solution. Past studies found that people who support the Democratic Party ideology were prone to acknowledge the problem of climate change is real. Also, they were less averse to the situation in which governments play a leading role in solution design and implementation to the problem. Conversely, Republican Party ideology holders were found to be less likely to admit that the climate change problem was real. Furthermore, even though the problem exists, they do not see governmental intervention as adequate. Rather, market is the appropriate mechanism that the Republican Party ideology believers support.

A previous study conducted by Bartling (2018) has discovered the relationship between CCA referendum passages in Illinois’ cities and some citizen characteristics. He found that factors including higher education attainment of citizens, use of electricity for home heating and older age of citizens, were related to greater support from citizens for passing a CCA program. Meanwhile, higher unemployment was related to less support from the citizens. Another empirical research studied formation of CCAs published in 2019. Armstrong (2019) evaluated the relationship between CCA adoption and several factors including citizen ideology in Californian counties. He found factors like Democratic Party and Green Party ideologies, higher environmental support, higher local control support, higher education attainment, higher climate vulnerability of the county, larger population and higher household income, were related to greater probabilities of CCA adoption. At the same time, factors such as more white-population and larger fossil-fuel to clean energy job ratio, were related to lower probabilities of the adoption.

By far, no academic research has examined the relationship between CCA formation and citizen ideology at the municipal level, while municipal governments are the basic and major adopters of CCA programs. This paper aims to fill this gap by assessing this relationship at the municipal level. Besides this contribution, this paper also explores the relationship through a more complicated version of political market framework, which adds government institutions as a mediator to the relationship between public preferences and policy adoption. The findings provide insights to energy policy adoption.

**Government Institutions as The Mediator to the Demand-Supply Relationship**

Proposing a more complicated framework of the political market, scholars have demonstrated existence of mediators between the demand and supply sides. Among several mediators, government institution is a very important one. A lot of studies have evaluated how different forms of government are leading to distinct decisions of policy adoption by local governments.

Two predominant forms of government were used as indicators in those studies: mayor-council and council-manager governments. The former form of government is a traditional way of governance in the U.S. Under this type of government, legislation and execution of the policies are responsibilities of elected officials, namely council members and mayor. Council members are the legislative body, while mayor is executing the policies made by the council members. Differently, the council-manager form of government does not only include the council members and mayor, but it also has a position of manager or administrator. In this type of government, the manager is the chief executive officer, while council members are making policies. The mayor is a representative of the city and has no differentiated power from other council members. A manager is normally appointed by the mayor with consent from the council members, which makes these two forms of government behave differently regarding motivations of the executives.

Since mayors are normally elected, their motivation of behavior will be largely shaped by re-elections. Hence, policy preferences of the constituents vastly influence decisions over policy adoption made by mayors. On the other hand, managers are appointed officials and their careers are not directly determined by constituents, which means they are less constrained by the public policy preferences. Precious studies concluded that mayor-council governments were more willing to adopt environmental policies if their constituents support the adoption, whereas council-manager governments were more likely to adopt policies based on their professional judgement. In other words, mayor-council governments are more likely to respond to the public policy preferences, while council-manager governments tend to be less responsive.

**Initiation and Adoption of CCAs in Illinois and California**

Illinois and California have totally different processes of making the decision on CCA adoption. Both of Illinois’ local governments and voters play direct roles in the decision-making processes. Firstly, a local government initiates CCA referendum as an election question. Then, voters decide whether or not to pass the referendum based on a majority vote. In such scenario, the government decide on the initiation and the voters decide on the final adoption. Thus, local governments only play a role in the CCA referendum initiation process, which is the focus of our application of the political market framework.

At the same time, Californian local governments directly decide whether or not to adopt CCA program in their jurisdictional territories. The governing boards of those governments use a majority vote to pass the adoption.

**Public Policy Preferences and Government Decisions on CCA Program**

Although local governments make direct decisions on either initiation or adoption of the program, public preferences still play an indirect role in influencing their decisions. For mayor-council governments, the influence tends to be greater as elected officials are motivated to fulfill their constituents. Whereas the influence to managers in the council-manager governments should be smaller. Even though managers do not have the power to make policies, they exert an influence on elected officials they are working with, since they are the person who eventually carry out the policies in daily operations.

As implied by the simple political market framework, citizen ideologies influence their preferences over CCA program and governments respond to the preferences. For Democratic Party ideology holders, their support to establishing CCAs incurs governments to be more likely initiate or adopt the program. However, if most constituents of a community are prone to Republican Party ideology, the government is not supplying the program since the constituents are less likely to demand the program.

While adding the form of government into the framework, the relationship between citizen ideology and government response could be different. Under the complicated version of political market framework, the form of government mediates the responsiveness from policy suppliers to demanders. As indicated by the motivations of different types of governments, the mayor-council governments should be more responsive to the public demand. Conversely, the council-manager governments could be less or even not responsive to the demand.

Hereby, we propose two hypotheses for this study:

***Hypothesis 1****: Communities with higher portion of Democratic Party ideology voters are more likely to initiate or adopt CCA programs.*

***Hypothesis 2****: Form of government mediates the relationship. The relationship retains in mayor-council governed communities, but weakens or disappears in council-manager governed communities.*

**Paper II: How Existence of Governmental Purchasers Affected Construction of Local Distributed Energy Systems: A Case Study of Community Choice Aggregation Program**

California had a statewide energy crisis in 2001, and its residents suffered from large-scale blackouts and drastically increased electricity prices. Before Illinois adopted the community choice aggregation (CCA) authorizing legislation, the increasing electricity prices also continually bothered the legislators and their constituents. While they were trying to pass the CCA authorizing legislations, the legislators have explicitly expressed their expectations of a more competitive energy market and lower energy prices. Also, related legislative documents mentioned the willingness to develop renewable sources, although at the expense of higher energy prices.

**Expected Goals of CCA Program**

What the CCA program and the legislative documents imply is the necessity of developing local energy sources. The concept of CCA is largely rooted in energy democracy literature, which got its popularity in Europe through several social movements on climate change and energy transition since 2010s. Energy democracy emphasizes on public participation in energy decision-making. At the same time, it advocates community control over energy sources and local renewable energy utilization. A very important method for achieving energy democracy, according to the literature, is re-municipalization (). Re-municipalization is a process that community governments take back the power to make energy decisions from private energy companies, as they are not likely to pursue benefits of ordinary citizens. From the view of energy democracy advocates, private energy corporations are profit maximizers and only responsible to their shareholders. Thus, citizens must take over the power to make energy decisions, via publicly controlled and participable entities like local governments.

CCA is deemed as a policy tool for practicing re-municipalization and achieving energy democracy (). According to the literature, having enough local energy sources are necessary for developing energy resilience and reducing energy insecurity. Centralized power plants usually sell electricity they generate to the wholesale market and residential customers get electricity by paying prices to energy retailers. This may work well during normal time that electricity is sufficient for supplying all customers need it. However, in the cases of limited supply or sharply increased demand, rising prices and energy shortages incur extra costs on customers, especially on disadvantaged customers. Hence, building energy generating systems within local communities is considered important nowadays, for lowering energy prices, increasing community control over energy sources and secure energy supplies.

**How CCAs Promote Net-metering and Utilization of Local Renewables**

Besides aggregating demand loads of enrolled customers and negotiate prices and renewable content with energy suppliers, CCAs can be selective on their energy suppliers (). As local entities that are controlled by working on behalf of citizens reside within their jurisdictional territories, CCAs are expected to prioritize purchasing energy from local generators. The local generators, including those residential and small-scale onsite energy systems, sell electricity surplus to the wholesale energy market through the program of net-metering. Some CCAs pay relative higher prices for the surplus to their enrolled customers who participate the net-metering program. Even though not every CCA pays the higher prices, all of them pay as same as the retail electricity price per kilowatts to the customers who sell their surplus. Although IOUs have the net-metering program as well, they may not be the final purchasers of the electricity produced by the local generators, as they have their own power plants. In other words, IOUs have their own supply sources and may not need the extra supply during periods without energy shortages.

CCAs are potentially major buyers of the electricity that the distributed energy generators input, as most of them do not own any power plant and have to purchase electricity from the wholesale market. It is very likely for residents and building owners to decide installing small energy generators in their homes or buildings, considering there is a relatively stable demand for their electricity surplus if they participate in CCAs.

The prospect of net-metering leads to more installations of renewable energy generators (). According to NR, centralized energy generators that rely on processing fossil-fuels are usually operate in large-scales due to characteristics of the energy generating process. It requires a huge amount of capital investment to commence the operation, and investors need to spend a lot on continuous input of fossil-fuels and labor. Thus, it is impossible for residential and small-commercial investors to build fossil-fuel-based generators. On the other hand, renewables-based generating systems tend to be a good choice for residential and small-business consumers. Firstly, the capital investment is affordable, compared to building a fossil-fuel-based power plant. Also, the distributed renewable energy generators incur much less operational cost during usage, since the energy sources are free and no post-generation treatment needed compared to methods like coal-burning.

Besides being major purchasers of the net-metered electricity, CCA program also contribute to the development of distributed renewable energy sources by providing assistances to people who like to install the systems. Funding sources: public fund from state governments and funding from private corporations.

States authorize CCA program for achieving several goals. According to state legislative documents, institutional reports and academic papers, the program was expected to:

* 1. lower electricity prices
  2. increasing local control over energy sources (especially renewable energy sources)
  3. renewable energy generation
  4. energy democracy and justice goals like higher public participation in energy decision-making and equitably distributed costs and benefits

They normally do not have their own power plants, and are expected prioritize purchase of electricity from distributed renewable energy generators than from huge privately-owned energy corporations --- local investors should be more willing to invest in the distributed renewable generators as they have stable buyers (as expected by Illinois state legislators regarding how CCA would promote market competition) --- CCA should have promoted local installation of energy generators, especially renewable energy generating facilities that can be distributed and smaller than fossil-fuel burning power plants

**Paper III: Should Investor Owned Utilities Oppose CCA Program? Discovering the Customer Base and Revenue Changes of Utilities After Experiencing Operation of CCAs**

Several IOUs claim CCAs have caused them to lose customers and their profits were also hugely reduced, and they predicted their loss would continue and around 80% of their customers will be with CCAs. Cases in California and Ohio have demonstrated how IOUs opposed CCAs. In California, IOUs utilized their marketing advantages to disseminate false information about CCA. Also, they spent their money and lobbying power trying to make the vote requirement of CCA adoption more difficult, though the attempt finally failed. Meanwhile, IOUs in Ohio persuaded state policy makers to adopt and extend the Rate Stabilization Plans, which sharply eliminated competitiveness of CCAs. These are some demonstrations of conflicts between IOUs and CCAs, which implies the tension between these two parties.

While IOUs were claiming how CCAs had negatively impacted them, some energy news reporters stated that CCAs would not harm IOUs so badly. According the reporters, although a portion of customers had left IOUs and enrolled with CCAs, the revenues of IOUs were not reduced. IOUs would still be responsible for other profitable services like electric transmission and distribution to CCA customers. Furthermore, IOUs could still make profits from the rate of return structure as they recover the infrastructure costs by collecting certain non-passable surcharges from customers in both IOUs and CCAs, which is a legal previous-cost-containment mechanism allowed by state legislations.

The debate has been continuing and the claims of both sides have not been tested. In this paper, we are comparing states that have a deregulated energy market with and without CCAs, in terms of the number of IOU customer and IOU operating revenue for a period before and after mass adoption in states with CCAs. The study is figuring out whether CCA program has harmed IOUs as what IOUs claimed or CCAs has not harmed IOUs as the reporters suggested. Knowing the answer is important for promoting the cooperation between CCAs and IOUs, which is essential for CCA development. CCAs rely on IOUs for customer information sharing and update, the information is important for forecasting the energy demand load and maintaining a stable energy supply. Also, CCAs need IOUs to provide their customers indispensable services like electricity transmission, distribution and billing.

We look for the findings to provide insights to solutions to the CCA-IOU conflict. If CCAs have really harmed IOUs, policy makers may need to come up with a mechanism to distribute the costs and benefits between IOUs and CCAs, in order to prevent further conflicts. On the other hand, if CCA has not harmed IOUs, the results could help IOUs and policy makers to make more informed decisions. Also, it provides a new assessment tool regarding cost and benefit analysis of energy policies.

CCA adoption literature:

-current literature has not assessed how the form of government influenced Illinois’ local governments to initiate CCA referenda, and no examination on how citizen ideology impacted passage or failure of the city-level referenda (according to the state legislation, local governments initiate the CCA referenda and voters vote for deciding the final adoption)

-no other empirical study found that examined factors influencing the formation of CCAs

Hypotheses:

CCA referendum initiation and form of government

-CCA does not demonstrate its effectiveness shortly after its formation, since preparation for the actual operation normally needs more than one year. Meanwhile, implementing CCA program could drastically change the existing arrangement of energy management and structure of the energy market. There could be some uncertainties regarding IOUs’ reaction, which might impact constituency of the elected politicians

-CCA’s stated goals are closely related to efficiency and sustainable development, as the most frequently mentioned goals are lowering energy prices and promoting renewable energy utilization and thus contribute to GHG emission reduction in long-run

*Hypothesis 1: Council-manager governments are more likely to initiate CCA referenda than mayor-council governments*

CCA referendum passage and citizen ideology

-CCA program aims to promote renewable energy generation and utilization

-CCA program is expected to replace existing privately-owned electric utilities, in other words, it is used to change the market from privatization to re-municipalization

-CCA program leads to higher level of government involvement in energy decision-making and management

*Hypothesis 2: It is more likely for a community to pass the CCA referendum initiated by its local government if it has more Democratic Party ideology supporters*

1. Policy effectiveness evaluation literature

Policy evaluation:

-policy process cycle: problem emergence, agenda setting, policy alternatives, adoption of certain alternative(s), implementation, evaluation

-policy evaluation is essential for knowing whether design and implementation of the policy adopted are adequate and practicable

-summative/outcome evaluation is conducted after the implementation to assess if the policy has achieved its expected outcomes

-if yes --- results can suggest to the consideration of policy continuation and expansion

-if no --- policy improvements or even termination may be necessary

Expected outcomes of CCA program:

-state legislation, institutional reports and academic papers: reduction in energy prices, renewable energy generation, local control over energy sources (distributed renewable energy generation), public participation in energy decision-making (energy democracy and energy justice goal)

-local control over energy sources is an important goal concerning development local energy resilience and self-reliance; the goal is fulfilled by distributed renewable energy generating facilities since fossil-fuel-based energy generating systems are concentrated in a small amount of places, small communities may not be able to afford the fossil-fuel-based systems; and normally, the literature links local control over energy sources with renewable energy sources like small-scale wind and solar systems

Existing CCA effectiveness evaluation:

-Amstrong (2019): averagely higher targets of renewable portfolio standards (RPSs) of CCAs compared to the state RPS and increasing component of renewable energy procurements of CCAs

-Deryugina et al. (2020): 250 Illinois’ cities; electricity prices and CCA (negative); electricity demand and CCA in long-run (positive)

-effectiveness of CCA in achieving the goal of reduction in electricity prices is assessed

-RPS setting may not well demonstrate utilization of local renewable sources, since CCA can purchase renewable energy credits (RECs) to meet the requirement

-no other empirical studies found that have evaluated the effectiveness of CCA program in achieving the expected outcomes

-expected goals remain unexamined: renewable energy development, local control over energy sources, public participation

-examining the overall renewable energy generation change may not demonstrate how the CCA program influenced it, as the use of RECs makes it hard to trace the plant generating the renewable energy to wholesale market consumers, especially if the generators are concentrated in certain states

-no voting data after establishments of CCAs is related to energy decision-making, which means no data is available now for examining achievement of the public participation goal

-thus, this paper explores effectiveness of CCA in achieving the local renewable energy generation goal

Hypotheses:

-CCA is expected to promote local control over energy sources

-distributed renewable energy systems are more suitable for local communities to generate energy

-more renewable energy generating facilities should be built by the community or local businesses as CCAs can be the stable consumers of the energy they produce, compared to communities without the program

*Hypothesis: Implementing a CCA program in a community has led to increased renewable energy generation from those locally-owned facilities*

1. Literature on CCAs and IOUs

-IOUs provide and update customer information to CCAs, so that CCAs can enroll potential customers and forecast the aggregate demand load

-IOUs provide transmission, distribution and billing services to CCA customers

-cooperation from IOUs is critical for CCA operation

-Trabish (2018), Roth (2019): IOUs also play a role of providers of last resort for customers who decide to return

-*SB 790* (CA 2011), Littlechild (2008), Faulkner (2010), The Next System Project (2020), Trabish (2021), Kennedy and Bailey (2021): cases of how IOU oppositions impeded CCA development in California, Ohio and New Hampshire

-Power (2017), Trabish (2018), Liberman (2019), Goodland (2020), Kennedy and Bailey (2021): IOUs worry about loss of customers and potential loss of their profits, due to a quickly increasing number of customers have been leaving IOUs and enrolled with CCAs

- Power (2017), Roth (2019), IOUs’ rate schedules: IOUs do not profit from energy sales, but from other activities (eg. transmission service, distribution service, billing service, electric vehicle charging station construction)

-Power (2017), Trabish (2021), IOUs’ rate schedules, AB 117 (CA 2002): IOUs still charge certain non-bypassable surcharges from customers in IOUs and CCAs to recover its investment on power plants and other electric infrastructure

-no academic research found that explores the impact from CCA program to IOUs, let alone empirical research

🡪for promoting the cooperation and eliminating conflicts between CCAs and IOUs, it is necessary to figure out whether CCAs have been causing IOUs to lose their customers and profits

🡪if yes --- need to come up with certain mechanisms to re-distribute the costs and benefits among CCAs and IOUs, in order to alleviate their conflicts and encourage their cooperation in long-run

🡪if no --- the finding could be used to educate IOUs and policy makers, they will be more likely to make informed decisions regarding adoption and operation of CCA program

Research question:

-the debate: CCA has reduced the number of customers and profits of IOUs within territories that authorize CCA formation vs. CCA has not reduced profits of IOUs as IOUs do not profit from energy sales and they are still make profits from services like transmission, distribution and billing, plus they charge CCA customers from certain non-bypassable surcharges for cost-sharing over past capital investment

*Research question: How has CCA program impacted the customer base and profits of IOUs in states that authorize the program, compared to those of IOUs in states without such authorization?*

Data Collection

1. Dependent variable 1: CCA initiation (whether a local government has initiated a CCA referendum) (county government websites & Illinois State Election Board Referenda Search; city list-Cubit)

Explanatory variable 1: form of government (0=mayor-council; 1=council-manager) (city government websites)

Control variables: population (American Community Survey), government ideology (ideology held by the majority of council members) (government boards info), membership of the United States Conference of Mayors (organization website)

Dependent variable 2: CCA formation (county government websites & Illinois State Election Board Referenda Search; city list-Cubit)

Explanatory variable 2: citizen political ideology (0=Republican; 1=Democrat) (precinct-level voters’ party affiliation data)

Control variables: household median income (American Community Survey), rate of bachelor’s degree or higher education attainment (American Community Survey), unemployment rate (American Community Survey), age (American Community Survey), ethnicity (American Community Survey), population

-All variables are from the year around 2010

-Cross-sectional two-group comparisons: cities initiated CCA referenda vs. cities not initiated the referenda; cities passed the referenda vs. cities failed the referenda

1. Dependent variable: generation amount of the locally-owned renewable energy plants in a community (EIA-923 datasets-annual electricity generation and fuel composition), locally-owned facilities refer to city or county-owned renewable energy facilities, also companies that base in Illinois cities & without traceable branches or headquarters in other states

Explanatory variable: whether the community has CCA program (0=no; 1=yes)

Control variables: population (American Community Survey)

-Variables are from year 2007 to 2021 (5 years prior to the mass adoption activity in Illinois and 9 years post it)

-Longitudinal Two-group comparison: Illinois cities with and without CCA program

-Why city-level comparison: the basic unit of CCA adoption is cities, towns and villages, most of the decision-makers are at the city level; county adoption in Illinois refers to establishing a CCA in unincorporated areas of that county

1. Dependent variable 1: number of an IOU’s residential customers (ICC Electric Switching Statistics & Oregon Public Utility Commission Oregon Utility Statistics Books)

Dependent variable 2: operating revenue from the electric operations of the IOU (IOU 10-K reports)

Explanatory variable: whether the IOU is in a state that authorizes CCA program (0=no; 1=yes)

Control variables: revenue from natural gas operations (IOU 10-K reports), revenues from non-residential operations (IOU 10-K reports), average state electricity retail price (EIA State Electricity Profiles), state population (State Population Totals from the US Census Bureau)

-Variables are from year 2007 to 2021 (5 years prior to the mass adoption activity in Illinois and 9 years post it)

-Longitudinal Two-group comparison: IOUs in energy-deregulated states with & without CCA program