

The Market for Institutions ¹

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Abstract

What types of institutions do people create to provide the products they demand? Historically, the world has seen three types of institutions: private, public and non-profit. Economic theory provides little guidance as to how and when different types of institutions are created to serve the products and services which people want and need. Are hospitals better kept public? Should churches remain as non-profits? Do household prefer buying their cars from private entities? Any answers to these questions require addressing endless nuances and complete solutions are difficult to establish without partial tradeoffs. This work introduces a phenomenon, called institutional substitution, to provide new lens on the origins of organizations.

¹Alternative title: Inequality and Institutional Substitution.

1 Introduction

The first form of government was created between 3500-2332 BCE by the Sumerians in Mesopotamia. The oldest monastery in the world, the Monastery of Saint Anthony, was built between 298-300 AD during the reign of Constantius Chlorus and the worlds oldest continuously ongoing independent company, Kongō Gumi, was established in Japan, 578 AD.

All organizations across the world have taken one of three organizational forms, namely private, public and non-profit. As societies developed through coordination, generally speaking “people” were the ones that had the final say as to which types of organizations would provide certain products and services. While the weight on an individuals “say” was highly dependent on inequality, class structure and other societal inequities, people, through various channels of coordination dictated the organizational forms that provided products and services. In the Roman Republic, taxes levied from the public were used to finance largely public military institutions as opposed to private institutions, e.g. mercenaries. The Red Cross on the other hand was established in 1859 and not funded using public capital. Instead, it was established as a non-profit (or voluntary) institution largely based on the donations (or volunteers) from the public. It was implicitly agreed upon that the non-profit form was deemed the appropriate organizational structure to help those wounded by wars. On a similar note, the Ford motor company was established in 1903 and implicitly, it was a collective agreement that such an organization was best established as a private entity. Though it may seem like an odd and obvious statement, the fact of the matter is; people (in this case the consumers) would rather “pay” to receive cars rather than “donate” or “pay taxes” for them.

While economists have traditionally focused their attention on the efficiency and success of the private sector, this is only part of our collective coordination. The private sector, primarily dominates our goods based market place (e.g., consumer goods), but public and non-profit entities provide countless products and services to which we rely upon. As households, we have dictated through various forms of financial coordination, the amount that is directed towards private entities (via purchases), towards public entities (via taxes), and towards non-profits (via donations). For all those payments, we receive a variety of benefits from cars to health care related services. To put this in more concrete terms, in the United States, there are 28 million businesses employing 127 million people with total business sales of 1.5\$ trillion. The public sector on the other hand employs 22 million people while receiving total annual tax revenues of 3.2\$ trillion. Furthermore, there are 1.5 million nonprofit organizations in the United States employing 12 million people with total annual donations of 0.4\$ trillion. Clearly,

there is currently no dominant institutional form.

People divide their financial capital between a variety of “accounts”. Some of our capital goes to financially motivated investments and some to socially conscious investments. Traditionally, these “accounts” have been completely separate, i.e. I demand financial returns from my financial investments and social returns from my social investments. However, with the rise of the socially responsible investment market reaching near 70\$ trillion, it is time we ask if and how the household investment demand affects economic welfare. In other words, what forms of capital allocation (e.g. payments, donations or taxes) are better for tackling societal issues (e.g. waste, poverty and public health)? Furthermore, if financial capital was unequally divided, how would this affect optimal coordination? If the rich get richer, will their increasingly larger philanthropic donations be a better source and more efficient use of capital compared to a financially equal world, with higher tax revenues and a more powerful state? This very complicated question, is the essence of this paper.

Using a conceptual model, this paper makes a conjecture as to why inequality is expected to influence the relative composition of institutions. Furthermore, by using data on charitable organizations, schools, hospitals and fire departments for the U.S., this paper attempts to provide partial evidence for this previously unknown phenomenon of institutional substitution. Using cross-country data on inequality, health care and schooling, this paper provides additional evidence on the global existence of institutional substitution. Lastly, in order to make any statements on the welfare implications of this phenomenon, the final section of this paper dives into the nature of fire departments and their relationship with historical fire related incidents.

The policy implications of this paper lie in the details. There has been a long documented link between wealth inequality and a large set of welfare negative outcomes including life expectancy, child wellbeing, mortality and other health and social problems, i.e., levels of trust, mental illness, life expectancy, obesity, children’s educational performance, teenage births, homicides, imprisonment rates and social mobility (Wilkinson and Pickett, 2010). Addressing all these issues require the understanding of endless nuances. However, this paper does present evidence of a channel that drives these connections. Therefore, the findings of this paper suggest that institutional substitution is a policy relevant topic. If there exists a non-politically compromised social planner in an unequal society, the results of this paper suggest policy interventions aimed at slowing the pace of institutional substitution (e.g. via taxation) is of welfare enhancing importance.

The remainder of the paper is structured as follows: Section 2 provides a conceptual model. Section 3 elaborates on the composition of the initial data and section 4 presents the main empirical findings. Section 5 provides a dedicated analysis on fire departments, and section 6 concludes.

2 Conceptual Model

The aim of this section is to provide a conceptual model to guide our empirical expectations. In this model, a population of consumers demand products from three types of institutions; private, public and non-profit. Each institution will provide one product and therefore, faced with these three choices, the representative consumer will maximize utility by purchasing varying amounts of q_{firm} , q_{gov} and q_{ngo} . The consumer's total wealth will be fully spent across all three types of products. For example, a representative consumer could split their purchases by buying 70% of the products from the firm, 20% from the government and 10% from the NGO. As such, the consumer's utility function is defined below.

$$U = \left[\underbrace{U(q_{firm})}_{Product\ Utility} - \underbrace{C(q_{firm})}_{Cost\ of\ Purchase} - \underbrace{E(q_{firm})}_{Environmental\ Externality} \right] + \left[\underbrace{U(q_{gov})}_{Environmental\ Externality} - \underbrace{C(q_{gov})}_{Taxes} \right] + \left[\underbrace{U(q_{ngo})}_{Environmental\ Externality} - \underbrace{C(q_{ngo})}_{Donation} \right]$$

s.t

- 1) $0 \leq q_{firm}, q_{gov}, q_{ngo} \leq 1$
- 2) $\underbrace{p_{firm} * q_{firm}}_{Product\ Purchases} + \underbrace{p_{gov} * q_{gov}}_{Taxes} + \underbrace{p_{ngo} * q_{ngo}}_{Donations} = 1$

For the benefit of the next illustrative examples, lets assume the "firm" in this model provides a product that is used to counter a general negative externality (e.g. water pollution). Therefore, instead of using $[U(q_{firm}) - C(q_{firm}) - E(q_{firm})]$, we replace it with $[U(q_{firm}) - C(q_{firm})]$. Furthermore, let's assume that all the institutions provide the same product. In this conceptual model, quantities and prices will be determined by the maximization processes of the three types of institutions shown below. Each type of institution will maximize their profits subject to their institution-specific revenue and cost functions.

- 1) $\max \Pi_{firm}(q_{firm}) = TR(q_{firm}) - TC(q_{firm})$
- 2) $\max \Pi_{gov}(q_{gov}) = TR(q_{gov}) - TC(q_{gov})$
- 3) $\max \Pi_{ngo}(q_{ngo}) = TR(q_{ngo}) - TC(q_{ngo})$

To set our expectations, let's assume the market works in three steps. First, the firm will maximize its profits based on the demand function it faces. The government will be second and the NGO will be third. This is rather intuitive. For the sake of conceptualization, let's think of a particular product, such as waste removal services. Quite often, if an NPV positive project exists, a firm is among the first types of institutions to appear and exploit the opportunity. If demand is not high enough for the private sector, common interests (i.e. demand) and a general pooling of resources (i.e. taxes) will strive to provide the needed service. If there is any unmet demand from steps 1) and step 2) (e.g. very localized waste), an NGO will often appear to try and provide as much of the needed service as possible.

Inequality will be the driving feature of the demand functions in this conceptual model. If wealth is highly unequal (e.g., the top 1% of the population owns 80% of the wealth), for the rich, it would be much more beneficial to pay a private company for the provision of waste removal services (a common, yet local burden). This is because a similar quality service via taxation, provided for everyone, would create a relatively larger tax burden (and total bill) for the rich households. Therefore, in this scenario, the demand curve for the private sector will be very inelastic and as a result, firms will provide waste removal services for well-off localities. This will happen as long as the costs of purchase for rich households remain lower compared to receiving the equivalent service via taxes, i.e. as long as $C(q_{firm}) < C(q_{gov})$. In the second step, the government will provide "some" waste removal services, but not the full amount necessary for a welfare optimal outcome. This is because in unequal societies governments have tighter budget constraints due to relatively lower tax revenues. Lastly, because there still exists a demand for waste removal services from the general (though poor) population, NGOs will provide as much of the service as possible (e.g. via a volunteer labor force).¹

¹This model implicitly assumes that in an unequal world, there exists a political market distortion that does not allow for the general population to "vote" for higher tax rates. This could certainly be the case in the U.S. where taxes are often directed at specific products and services, e.g. the "sugar tax". Therefore, it would make sense for localities to propose and therefore vote for such measures (e.g. for an "income adjusted waste tax"). Furthermore, one could logically argue that the general population should vote to increase the tax burden on the rich in order to create welfare enhancing outcomes. While this certainly makes sense, empirically, this has not happened. As many countries across the world have become more and more unequal in the past decades, tax rates for the rich have either remained constant or surprisingly, have gone down. Therefore, for now, this model will assume that there exists a political distortion, which does not allow the "poorer" population to vote for a "fair" tax system.

Equal societies will produce an entirely opposite outcome. In a world with less inequality, there will be less (excessively) rich people and therefore, taxation will be among the optimal coordinative solutions for everyone. In this scenario, a fair tax system is a cheaper solution even for those in the top quintile of the income distribution. If everyone contributes a fair amount from their wealth, state controlled waste removal services will be among the most efficient and welfare optimal ways for people to coordinate. In these environments, societies will see relatively more government controlled institutions and relatively less private firms and NGOs.

If products q_{firm} , q_{gov} and q_{ngo} are *private goods* (i.e. excludable and rivalrous), as with local waste removal services, the ordering of institutions from 1) - 3) makes more intuitive sense as the demand functions are more likely to create positive NPV outcomes via the form of "purchases". However, if products are *club goods* (i.e. excludable and non-rivalrous), the ordering in some cases can be different. With *club goods* (e.g. private schooling, private parks, cultural initiatives and health care), it is more likely that the ordering will begin with 3), the NGOs. In other words, it is very likely that the demand functions will be higher or highest for non-profit institutions since these types of goods are more likely to be "paid for by donations" (at least partially) rather than purchases. This nuance may partially explain the driving forces of large philanthropic contributions originating from rich households to schools, hospitals and cultural initiatives.

It is important to mention that firms and NGOs are not necessarily mutually exclusive in the provision of *club goods*. First of all, it is very likely that the amount of firms can increase as well. For many *club goods* such as health care, higher demand from richer households can drive the supply of private health care providers (i.e. firms). In addition, these institutions often receive large philanthropic donations from foundations (i.e. non-profits), which largely exist due to single sourced philanthropic contributions. Therefore, with these two channels, the supply of both private and non-profit institutions would be expected to increase.²

3 Data

To begin the analysis, this study utilizes data from Frank et al. (2014) on U.S. state-level income inequality. The dataset offers a comprehensive panel of annual state-level income inequality measures constructed from individual tax filings available from the Internal Revenue Service. To be more spe-

²In this scenario, the role of the government institutions will remain small whenever $C(q_{ngo}) < C(q_{gov})$ or $C(q_{firm}) < C(q_{gov})$. As long as receiving similar services via taxation is costlier for richer households in an unequal society, firms and NGOs will play a larger role in the institutional market.

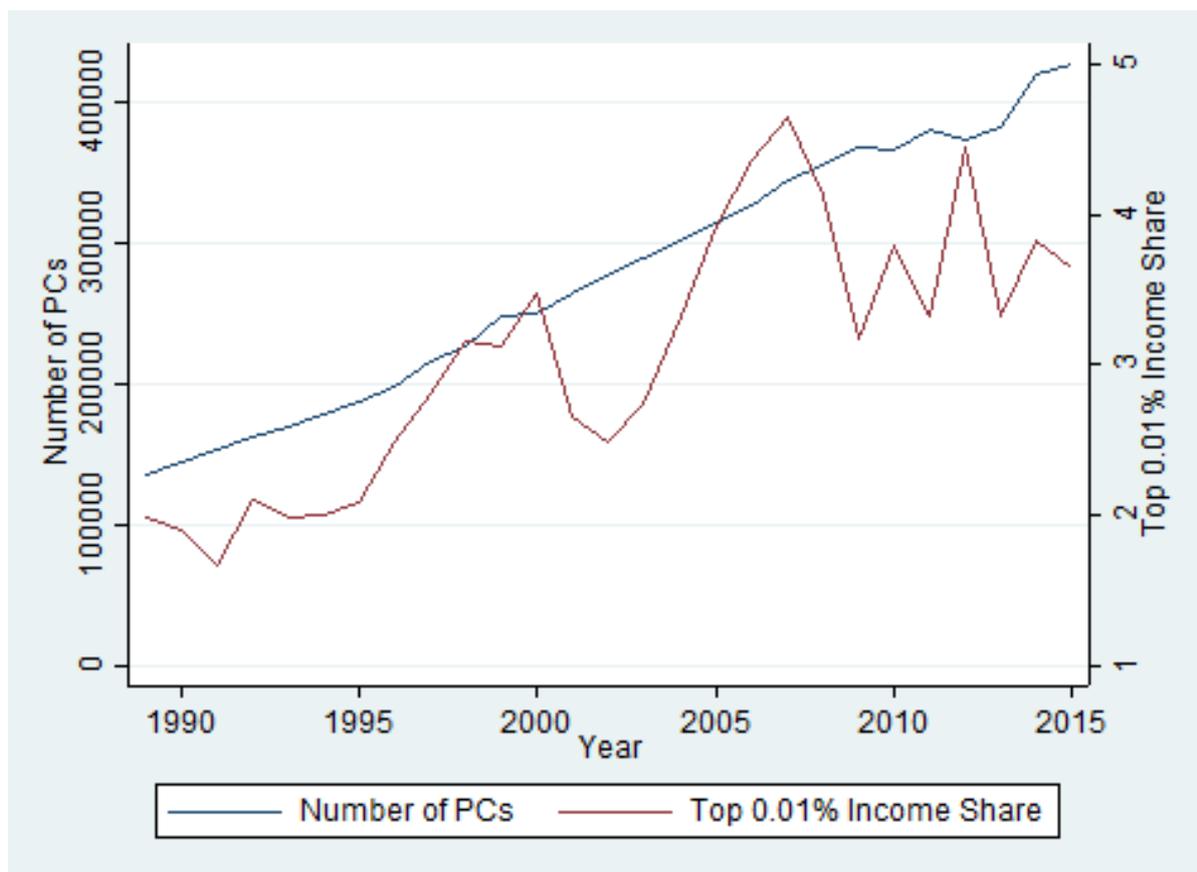
cific, the data provides the income shares of the Top 10%, Top 5%, Top 1%, Top 0.5%, Top 0.1% and Top 0.01% at the state level from 1917-2015.

In addition, this study makes use of the *National Center for Charitable Statistics* data archive, which provides data for all organizations in the U.S. that are required to file the form 990. The organizations that file this form include all public charities in the United States and the data is available since 1989.

4 Empirical Results

As a first glance into the findings, the graph below plots the number of public charities in the United States with the average annual income shares of the 0.01% of the population. As one can see, both income inequality and the number of charitable organizations in the United States has been increasing for the past two decades.

Figure 1: Inequality and The Number of Public Charities



While the graph in itself is interesting, it is best to test this relationship more formally. The next step of the analysis will be to run the specification below.

$$\text{Number of Public Charities}_{ct} = \alpha_0 + \beta_1 \text{Income Inequality}_{it} + \alpha_i + \theta_t + \epsilon_{it} \quad (1)$$

The number of public charities is at the county level, while income inequality is at the state level. The analysis incorporates data from 1989 - 2015 and will include year and state fixed effects to account for any average year or state specific factors that might drive the supply of public charities. As an example, the post-2010 year dummies are especially crucial. As shown in the graph, there was a slight dip in the number of public charity registrations. This was mostly due to new legislation, which updated the requirements as to which types of organizations could qualify as public charities. This did not mean that there were less non-profit organizations, but rather that not all of them were categorized as “public charities”.

The results for this analysis are shown in table 1. As one can observe, state-level inequality is a significant and positive driver of the number of county level public charities. What is more interesting, is that the relationship becomes larger in magnitude when you move up along the income distributions, i.e. incomes shares of the top 10% vs. income shares of the top 0.01%.

Table 1: Number of Public Charities and Inequality

VARIABLES	(1) Δ Number of PCs	(2) Δ Number of PCs	(3) Δ Number of PCs	(4) Δ Number of PCs	(5) Δ Number of PCs	(6) Δ Number of PCs
Income Share of Top .01%						0.310*** (0.119)
Income Share of Top .1%					0.261*** (0.083)	
Income Share of Top .5%				0.258*** (0.070)		
Income Share of Top 1%			0.242*** (0.071)			
Income Share of Top 5%		0.243*** (0.062)				
Income Share of Top 10%	0.223*** (0.050)					
Observations	78,932	78,932	78,932	78,932	78,932	78,932
R-squared	0.099	0.099	0.099	0.099	0.099	0.098
State FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Public charities are often considered the representative organization people think of when it comes to charities. A basic characteristic of a public charity is that they rely on contributions from the general public³. Private foundations on the other hand, are rather different. Private foundations are

³Generally, organizations that are classified as public charities are those that 1) are churches, hospitals, qualified medical research organizations affiliated with hospitals, schools, colleges and universities 2) have an active program of fundraising and receive contributions from many sources, including the general public, governmental agencies, corporations, private foundations or other public charities 3) receive income from the conduct of activities in furtherance of the organization’s exempt purposes or 4) actively function in a supporting relationship to one or more existing public

rarely the direct operation of a charitable program and their primary activities include making grants to other charitable organizations as well as to individuals. Moreover, the most distinctive feature of a private foundation is that they typically have a single source of funding. These are often gifts from one family or a corporation. Therefore, it is very likely that a significant proportion of these foundations exist as a result of high net worth philanthropy. With all of this in mind, one might expect inequality to not also drive the number of public charities, but also the number of private foundations. Using data from the *National Center for Charitable Statistics* on private foundations, table 2 replicates the findings of the previous analysis using private foundations as the dependent variable. As one can observe, state-level inequality is a significant and positive driver of the number of county level private foundations as well.

Table 2: Number of Private Foundations and Inequality

VARIABLES	(1) Δ Number of PFs	(2) Δ Number of PFs	(3) Δ Number of PFs	(4) Δ Number of PFs	(5) Δ Number of PFs	(6) Δ Number of PFs
Income Share of Top .01%						0.306** (0.145)
Income Share of Top .1%					0.280*** (0.101)	
Income Share of Top .5%				0.260*** (0.084)		
Income Share of Top 1%			0.226*** (0.083)			
Income Share of Top 5%		0.193*** (0.066)				
Income Share of Top 10%	0.248*** (0.063)					
Observations	55,167	55,167	55,167	55,167	55,167	55,167
R-squared	0.015	0.015	0.015	0.015	0.015	0.014
State FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

One might naively argue that institutional substitution is a welfare maximizing reaction to inequality. Once public entities stop providing crucial services (e.g. health care and waste removal), the public, including rich and poor, will find a way to coordinate. As a result, the contributions of the rich would carry a larger weight towards welfare enhancing outcomes using their philanthropic contributions. In order to say anything about welfare implications, one needs to find a service that has been historically provided by all three types of institutions (e.g., private, non-profit and public). In certain cases, there are natural overlaps, such as waste prevention. Quite often, households will demand firms to pollute less in their localities, they will demand public services for waste management removal (Wible, 2018) and demand charities for any additional unmet waste disposal services (Ash, 2018). As one might imagine, there are countless examples where overlaps exist. These include sectors

charities <https://www.irs.gov/charities-non-profits/charitable-organizations/public-charities>

such as education, health care and fire departments where all three organizational forms are found in the market place.

To get a sense of the possibilities, the figures below showcase the relationships between inequality and a wide variety of state level measures on schooling, education and fire departments. The reasons for picking these three industries is because these are services that have historically been associated with all three types of institutional forms. The data for these institutions was collected from the *Homeland Infrastructure Foundation-Level Data* website. The dataset provides hospital, school and fire department level datasets. For schools, they provide data on the number of private schools and public schools. For hospitals, the data provides information on the ownership characteristics of hospitals (e.g. private, nonprofit and government). Lastly, the dataset provides information on fire departments and whether they are considered volunteer departments or private fire departments. In addition, the data provides information on whether most of the fire fighters at the department are considered career fire fighters (i.e. whether they are paid). All the figures below are created using state level averages. Overall, the graphs show some interesting trends and provide a glimpse into the phenomenon of institutional substitution. Localities with higher levels of inequality tend to have more private institutions (e.g. private schools, private hospitals and private fire departments). On the other hand, areas with greater levels of equality tend to display higher shares of public institutions (e.g. public schools and government hospitals).

Figure 2: Inequality - Schools, Hospitals and Fire Departments

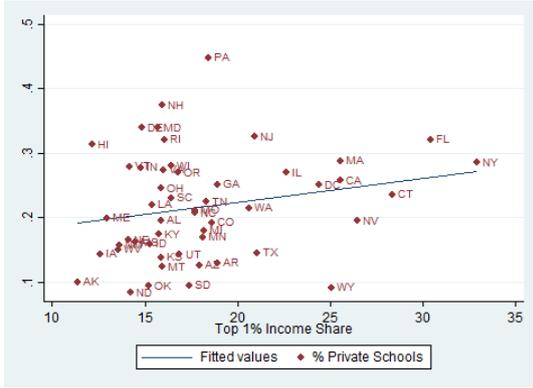


Figure 3: Private Schools

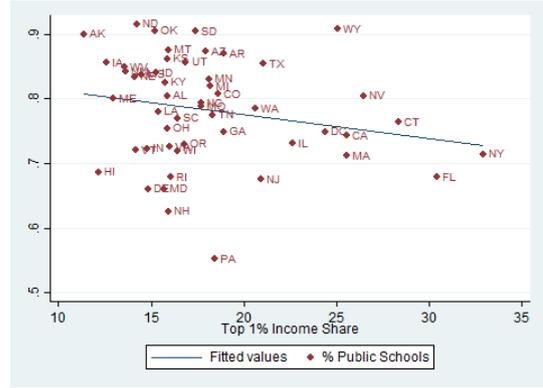


Figure 4: Public Schools

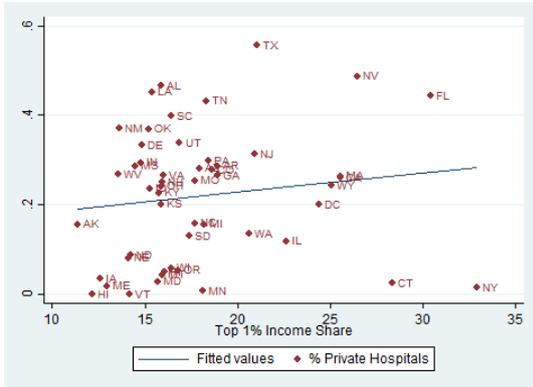


Figure 5: Private Hospitals



Figure 6: Nonprofit Hospitals

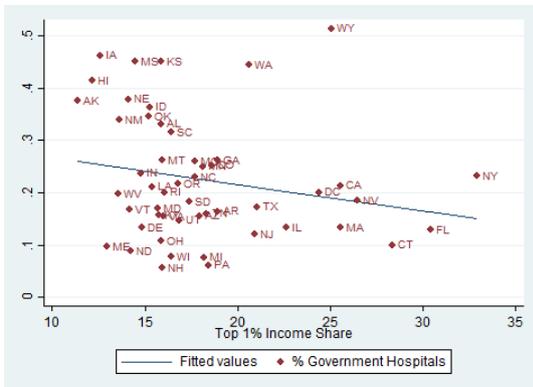


Figure 7: Government Hospitals

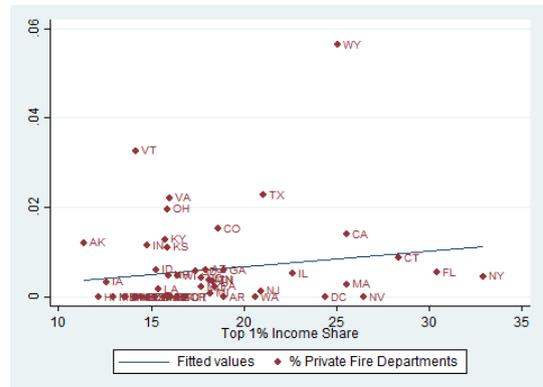


Figure 8: Private Fire Departments

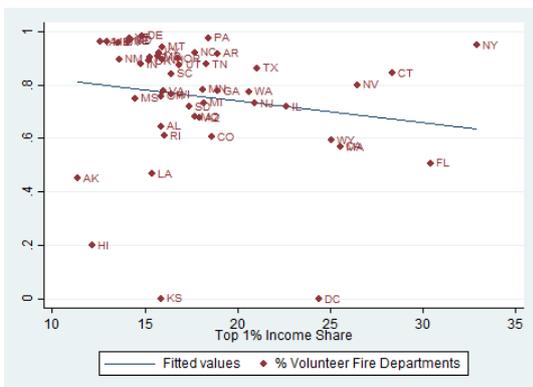


Figure 9: Volunteer Fire Departments

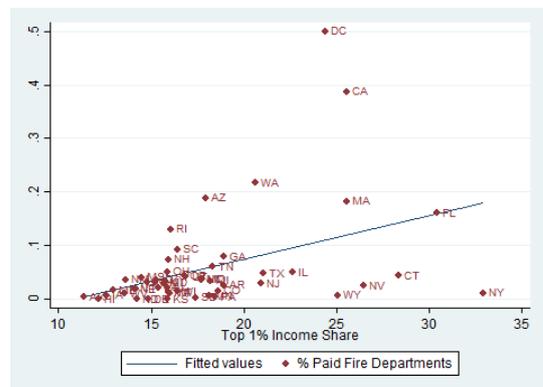


Figure 10: Paid Fire Departments

Institutional substitution is not only within the U.S. By using cross-country information from the *World Bank Open Data Indicators* dataset on inequality, schooling and health care, the graphs below show similar trends. Countries with higher levels of inequality measured by the Gini Index tend to spend more on private schooling and private health care. Relatively equal societies on the other hand spend more on public schools and public health care as predicted by the conceptual model.

Figure 11: Cross-Country Inequality - Schools and Hospitals

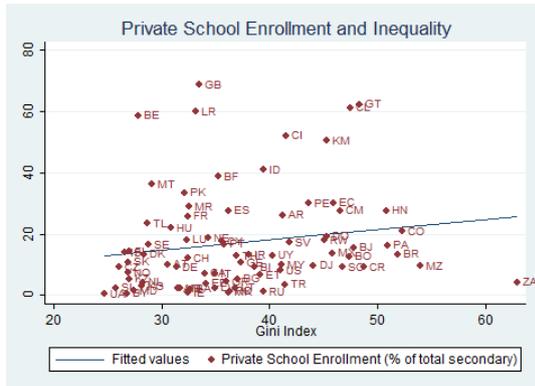


Figure 12: Private Schools

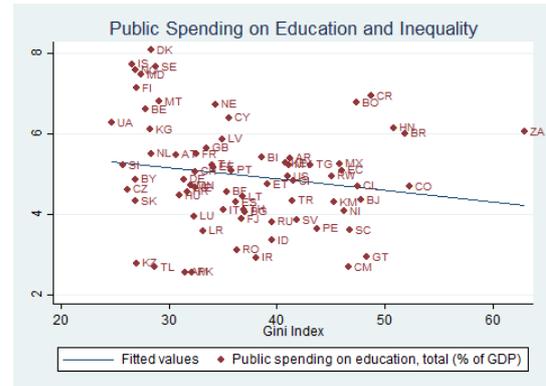


Figure 13: Public Schools

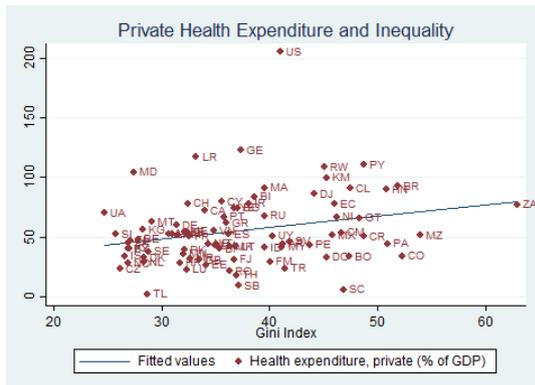


Figure 14: Private Health Care

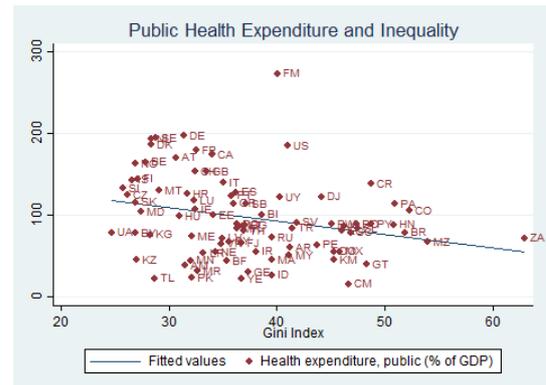


Figure 15: Public Health Care

In order to make any judgments on the welfare implications of institutional substitution, one must find a sector where these organizations provide households the (near) same exact product. One example of this is fire departments. Fire departments primarily provide fire safety, emergency care and put out fires. No matter where a household is located in the income distribution, people will always need and demand fire suppression and pre-fire management services.

5 Fire Departments

Fire fighting in the United States can be tracked back to the 17th century⁴⁵. In the early days, fire departments were mostly social as well as membership organizations. Once an individual member was in trouble, other members rushed for assistance. Later, insurance companies began forming private style fire brigades to protect their (often rich) clients' property⁶. These brigades would only fight fires at buildings the company insured which caused a variety of expected market inefficiencies. In many cases, fire departments would arrive to the scene and not extinguish the fire if the house was not insured. In addition, when departments began to compete, this too created unintended inefficiencies. In some cases fire departments would hire individuals to block access to fire hydrants from others to assure it's availability. Fights would ensue when other departments arrived earlier to the scene and demanded access. Soon, the public demand for municipalization forced nearly all fire departments to become public entities.

Today, there has been a small but noticeable increase in re-privatization in the fire fighting industry. In addition, as multiple devastating wildfires have been raging across California, private fire fighting crew helped save Kanye West and Kim Kardashian's home worth 50\$ million. Meanwhile, in 2013, an Arizona couple with a newborn baby lost their home to a fire and were then billed almost \$20,000 from the Rural Metro Fire Department. The independent agency said the family hadn't paid their annual fire service bill. They had (only) paid the fire district assistance tax, which funds the volunteer fire department in their area. Though they paid their tax, they had not paid the new annual fire service bill charged by the independent agency.

The data for this section comes from the *Homeland Infrastructure Foundation-Level Database* (HIFLD), which is a continuously updated dataset on nearly all fire stations and fire departments in the United States. Currently, there are an estimated 29,000 fire departments with an estimated 1.1 million firefighters. Approximately 345,000 of them are career firefighters and 800,000 are volunteer

⁴The first mention of firefighting in the U.S. was that of "bucket brigades". Volunteers patrolling the streets would wake up their colonial town once they spotted a fire. After the fire alarm was made, all households had to bring their leather buckets and organize a dedicated line between the fire and nearest source of water. All colonial homes were required to have at least two leather buckets by the front door in case of emergencies.

⁵Historically, the first known firefighting service was formed in Ancient Rome. It was formed by Marcus Egantius Rufus who used slaves to provide the free service. The first public fire department was established in 24 BCE by Emperor Augustus. The department was based in Rome and consisted of seven fire stations, manning 600 slaves. The first Roman fire brigade on the other hand, was created by Marcus Licinius Crassus. The fire brigade was a private entity and with his brigade of 500 firefighters, he would arrive at the scene of the fire. However, firefighters would only tackle the fire after bargaining over the price of the service. If negotiations failed, firefighters would let the structure burn down.

⁶To be clear, most fire departments remained as volunteer organizations, but due to their new incentive structure imposed by insurance companies (i.e. a revenue maximization model), these institutions began operating more like private firms than as non-profits.

firefighters. What is most interesting about the dataset is that it includes the ownership characteristics of each department. In other words, for each department, we know whether they are privately owned. These specific departments are formally categorized as either “*Industrial/Private*”, “*Private*”, “*Private or Industrial Fire Brigade*”, “*Independent*”, “*Industrial*” or “*Corporation*”. Out of the 26,358 fire departments in the sample, 172 of them are categorized as private entities. Using this classification, the analysis will incorporate a variable on the percentage of privately owned fire departments at the county level. With the state-level inequality measures used earlier, the analysis will examine the following empirical specification.

$$\% \text{ of Private Fire Departments}_c = \alpha_0 + \beta_1 \text{Income Inequality}_i + \alpha_i + \epsilon_c \quad (2)$$

The results from this analysis are shown in table 3. In line with earlier findings, higher levels of inequality are associated with higher levels of private fire departments.

Table 3: Private Fire Departments and Inequality

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	%Private FDs					
Income Share of Top .01%						0.006*** (0.000)
Income Share of Top .1%					0.004*** (0.000)	
Income Share of Top .5%				0.003*** (0.000)		
Income Share of Top 1%			0.003*** (0.000)			
Income Share of Top 5%		0.004*** (0.000)				
Income Share of Top 10%	0.004*** (0.000)					
Population	0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.000)
Observations	3,050	3,050	3,050	3,050	3,050	3,050
R-squared	0.032	0.032	0.032	0.032	0.032	0.032
State FE	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

To further stress earlier findings, the analysis will incorporate data on the “types” of fire departments. With this data, we can observe which fire departments are mostly run by volunteers. To be more specific, these departments are categorized as either “*Mainly Volunteer Providers*”, “*Mostly Volunteer*” or “*Volunteer*”. Out of the 26,358 fire departments in our sample, 5,734 of them are categorized as private entities. Using this data, the analysis will run the following specification below.

$$\% \text{ of Volunteer Fire Departments}_c = \alpha_0 + \beta_1 \text{Income Inequality}_i + \alpha_i + \epsilon_c \quad (3)$$

The results from this analysis are shown in table 4. In line with earlier findings, higher levels of inequality are associated with higher levels of volunteer fire departments. However, it is important to acknowledge that the results are not as significant compared to earlier findings. Nonetheless, both results suggest that inequality is a positive driver of institutional substitution.

Table 4: Volunteer Fire Departments and Inequality

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	%Volunteer FDs					
Income Share of Top .01%						0.016*** (0.000)
Income Share of Top .1%					0.011*** (0.000)	
Income Share of Top .5%				0.009*** (0.000)		
Income Share of Top 1%			0.009*** (0.000)			
Income Share of Top 5%		0.010*** (0.000)				
Income Share of Top 10%	0.010*** (0.000)					
Population	-0.000*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)
Observations	3,050	3,050	3,050	3,050	3,050	3,050
R-squared	0.508	0.508	0.508	0.508	0.508	0.508
State FE	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

But what about welfare implications? The next stage of the analysis will incorporate the “*Summary of Disaster Declarations and Grants*” data provided by FEMA. This historical dataset, provides locational level data for all major historical fires in the United States since 1953 at the state level. Using this data, the analysis below will examine whether inequality in general is historically correlated with more fires at the state level. The analysis uses both inequality and fire specific data from 1953 - 2015.

$$Disaster\ Fires_{it} = \alpha_0 + \beta_1 Income\ Inequality_{it} + \alpha_i + \theta_t + \epsilon_{ct} \quad (4)$$

As one can see from table 5, state level inequality is positively correlated with large fires. Interestingly, and similar to earlier findings, the relationship becomes larger in magnitude and in significance as you move up along the income distributions.

Table 5: Historical Fires and Inequality

VARIABLES	(1) Ln(Fires)	(2) Ln(Fires)	(3) Ln(Fires)	(4) Ln(Fires)	(5) Ln(Fires)	(6) Ln(Fires)
Income Share of Top .01%						0.485** (0.219)
Income Share of Top .1%					0.343** (0.146)	
Income Share of Top .5%				0.283** (0.119)		
Income Share of Top 1%			0.242** (0.109)			
Income Share of Top 5%		0.169* (0.094)				
Income Share of Top 10%	0.111 (0.077)					
Observations	3,264	3,264	3,264	3,264	3,264	3,264
R-squared	0.100	0.101	0.102	0.102	0.102	0.101
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

At this moment, it is important to acknowledge that using large historical fires can create misleading findings. Therefore, the previous analysis will be repeated using the *National Fire Incident Reporting System* (NFIRS) 2005-2014 data. While this dataset provides a much wider coverage of more generalizable fire related incidents (i.e., not just major fires), the minor drawback is that the current version of the data is averaged out at the county level. This paper currently does not have access to the historical NFIRS dataset. Nonetheless, the data provides comprehensive county-level cross-section of historical fires covering over 8 million fire related events. Incident types include 1) Residential Structure Fires 2) Nonresidential Structure Fires 3) Vehicle Fires 4) Outside Fires and 5) Other Fires. The next analysis will run the regression below with population adjusted measures for the number of reported fires at the county level.

$$Number\ of\ Reported\ Fires_c = \alpha_0 + \beta_1 \Delta Income\ Inequality_i + \alpha_i + \epsilon_i \quad (5)$$

In this specification, *Income Inequality* is the difference in income inequality at the state level between 2015 and 1975. The idea is to incorporate a variable that measures which states have experienced the highest increases in income inequality since 1975. The results for this test are reported in table 6. Similar to the earlier results, rising levels of inequality are positively correlated with reported fires.

Table 6: Reported Fires and Inequality

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	Reported Fires					
Change in Income Share of Top .01%						0.001** (0.001)
Change in Income Share of Top .1%					0.002** (0.001)	
Change in Income Share of Top .5%				0.004** (0.002)		
Change in Income Share of Top 1%			0.006** (0.003)			
Change in Income Share of Top 5%		0.018** (0.009)				
Change in Income Share of Top 10%	0.044** (0.022)					
2014 County Level Population	-0.000*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)
Observations	3,073	3,073	3,073	3,073	3,073	3,073
R-squared	0.345	0.345	0.345	0.345	0.345	0.345
State FE	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

As a final examination of the data, the analysis will run the specification below while also incorporating fire department level data from previous tests.

$$Number\ of\ Reported\ Fires_c = \alpha_0 + \beta_1 \Delta Income\ Inequality_i * FireDepartment_c + \alpha_i + \epsilon_c \quad (6)$$

The results from this analysis are shown in table 7. The dependent variable, *Number of Reported Fires*, is population adjusted at the county level. The current results suggest that counties experience less fires in unequal localities with more private fire departments. In addition, the results indicate that counties experience more fires in unequal localities with more volunteer fire departments. The results provide interesting and suggestive evidence of institutional substitution and the resulting welfare implications at the county level. Nonetheless, further analysis and historical county level fire reporting data will be necessary to make any further or reliable statements.

Table 7: Reported Fires and Inequality

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	RFs	RFs	RFs	RFs	RFs	RFs	RFs	RFs	RFs	RFs	RFs	RFs
c.Top001_adj#c.volunteer												0.002** (0.001)
c.Top01_adj#c.volunteer											0.001* (0.001)	
c.Top05_adj#c.volunteer										0.001 (0.000)		
c.Top1_adj#c.volunteer									0.001 (0.000)			
c.Top5_adj#c.volunteer								0.000 (0.000)				
c.Top10_adj#c.volunteer							0.000 (0.000)					
c.Top001_adj#c.private						-0.002 (0.005)						
c.Top01_adj#c.private					-0.003 (0.003)							
c.Top05_adj#c.private				-0.003 (0.003)								
c.Top1_adj#c.private			-0.003 (0.002)									
c.Top5_adj#c.private		-0.004*** (0.001)										
c.Top10_adj#c.private	-0.004*** (0.001)											
Income Share of Top 10%	-0.004*** (0.000)						-0.004*** (0.000)					
%Private FDs	0.157*** (0.051)	0.129*** (0.039)	0.055 (0.035)	0.038 (0.035)	0.018 (0.027)	0.003 (0.017)						
Income Share of Top 5%		0.002*** (0.000)						0.001*** (0.000)				
Income Share of Top 1%			0.001*** (0.000)						0.000 (0.000)			
Income Share of Top .5%				0.001*** (0.000)						0.000 (0.000)		
Income Share of Top .1%					0.001*** (0.000)						0.000 (0.000)	
Income Share of Top .01%						0.001*** (0.000)						-0.000 (0.001)
%Volunteer FDs							-0.007 (0.022)	-0.008 (0.015)	-0.007 (0.008)	-0.006 (0.008)	-0.004 (0.006)	-0.003 (0.006)
Observations	3,013	3,013	3,013	3,013	3,013	3,013	3,013	3,013	3,013	3,013	3,013	3,013
R-squared	0.350	0.350	0.350	0.350	0.350	0.350	0.352	0.352	0.353	0.353	0.353	0.353
State FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

6 Conclusion

The findings of this study highlight an interesting phenomenon, namely, institutional substitution. This is an attempt in documenting the market place of institutions and its resulting welfare implications. Generalizing and fully identifying these results will be difficult. However, they provide a unique angle as to how and when might certain organizational forms be born. As inequality increases, the wealthy rationally prefer paying for services directly than cater to their needs instead via taxes. As a reaction, non-wealthy residents must rely on volunteer services as their last resort.

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