The Impact of Centralized Budget Policy on National Parks: An analysis of the Federal Land Recreation Enhancement Act*

Willard Robinson

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Abstract

America's national parks face unprecedented levels of deferred maintenance, exceeding $22 billion. The Federal Land Recreation Enhancement Act (FLREA) of 2004 gave park managers local control over fee revenues, but raised concerns that it might lead to a crowding out of central appropriations dollars to parks receiving fee revenue. This research uses over 10,000 park-year observations spanning 1986-2019 to empirically test for this crowding out. By comparing fee-charging parks to non-fee-charging parks before and after FLREA, I examine whether increased local control led to crowding out of federal appropriations in those parks that earn fee revenue. The findings offer cautiously optimistic news: there is little evidence that FLREA led to systematic crowding out of federal appropriations. This suggests the policy succeeded in providing additional funding rather than replacement funding, but they also suggest no significant re-optimization of appropriations after major policy changes.

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1 Introduction

America's national parks are crumbling. With a deferred maintenance backlog exceeding $22 billion – a figure that has grown by over $5 billion in just five years – the National Park Service (NPS) faces an unprecedented funding crisis. Aging infrastructure, exploding visitation, and flat government appropriations have created a perfect storm threatening these crown jewels of American conservation. The most straightforward solution to the Service's backlog is to divert billions of dollars into the general fund, and, given the status quo, this is the most likely solution. The gap between revenues and costs has been growing at an increasing rate in recent history, and park managers are looking for creative solutions to close this gap, or at least slow the rate of divergence.

This funding crisis stems from a fundamental mismatch between costs and revenues, and understanding this crisis requires examining both its immediate causes and the policy tools available to address it. User fees represent one such tool. These have become increasingly critical, comprising over half of some parks' annual budgets.[1] Thus, fee policy decisions are crucial for park operations. But the incentives that park managers face and regulation over the use of fee revenues may be holding this tool back. Restrictions on which projects can be funded with user fees are made by the Service's central office in Washington, DC and placed on all parks uniformly. For a perfectly homogeneous set of parks, this is an efficient practice, but our national parks are not homogeneous. Indeed, the NPS was founded based on a two-fold mission: first, to conserve the unique natural and historical features of the parks; and, second, to make them accessible to the public in a way that does not jeopardize this (Kent & Smoot, 1916).

The multi-sided threat of aging infrastructure, exploding visitation, and a flat government appropriations budget explains the growth in deferred maintenance. As Walls (2022) notes, the parks system suffers from its own success: each year brings record visitation that generates more wear and tear while user fees remain relatively stagnant. The result is a growing gap where marginal damage from each additional visitor increasingly exceeds the marginal revenue they contribute. Each year, National Parks generally receive more visitors than the last (except during Covid) (Congressional Research Service, 2023). This creates more potholes, more strain on plumbing systems, and more erosion on roads and trails. More use generates more maintenance. While the infrastructure ages, it becomes weaker, and each visitor contributes more marginal damage. At the same time, with stagnant user fees, each visitor contributes the same additional revenue to the park. At some point marginal damage surpasses marginal benefit.

[1] Author's calculation using post-2004 revenue data.

While deferred maintenance has long plagued the NPS, the problem has intensified recently. Policymakers have responded with temporary funding injections like the Great American Outdoors Act (GAOA) of 2020 and the Bipartisan Infrastructure Law of 2023, but these represent short-term fixes rather than sustainable solutions. The GAOA contributed up to $1.9 billion annually to the Department of the Interior from 2020 through 2025, 70% of which goes to the NPS (Great American Outdoors Act, 2020). These funds come from revenues generated by energy development on public land which is not guaranteed to exist in the long-run, and the NPS must compete amongst other public entities for these funds. Under the National Bipartisan Infrastructure Law, the NPS received an average around $360 million annually, but this money can only be used at sites that receive at least 3 million visitors annually (Infrastructure Investment and Jobs Act, 2021).

A more promising approach lies in the reforming of how parks collect and use visitor fees. The Federal Land Recreation Enhancement Act (FLREA) of 2004 represented a fundamental shift in this direction, giving park managers unprecedented local control over fee revenues for the first time in decades. FLREA did three things that effectively localized control over the use of user fees: first, it made permanent that parks will be able to collect and retain fees; second, it gave park managers significantly more control over how fee revenue is spent; and third, it made explicit that federal appropriations should not be affected by the amount of user fee revenues that a park collects.

Whether fee collectors' incentives align with broader Service goals is a key economic question. Park managers, as economic agents, respond to incentives. For this reason, a thorough investigation into the policy guiding the use and collection of user fees in the NPS could highlight successes or failures of policies that attempt to correct incentive mismatch. This paper examines whether FLREA achieved its intended goals or created unintended consequences. Specifically, I ask: Did increased local control over fee revenues lead to a reduction in federal appropriations, creating a zero-sum transfer rather than additional funding? If so, did park managers respond by investing strategically in visitor-attracting infrastructure? To answer these questions, I compile a dataset of park-level appropriations from NPS budget justification documents spanning 1986-2019. Using difference-in-differences methodology that compares fee-charging parks to non-fee parks before and after FLREA, I find limited evidence of appropriations being crowding out. On the one hand, this suggests that the policy achieved its goal of providing additional rather than replacement funding. On the other hand, zero crowding out also suggests no re-optimizing of central budgets after the policy shift.

These findings have important implications for ongoing policy debates. With Congress

considering expanded fee authority and the NPS exploring new revenue models like international surcharges, understanding FLREA's track record is crucial for designing sustainable funding solutions. The paper proceeds as follows: Section 2 provides institutional background, Section 3 describes the data, Section 4 presents the empirical strategy and results, and Section 5 discusses policy implications.

2 Background

To understand the impact of recent policy changes, this section briefly outlines the evolution of NPS fee policies.

2.1 A brief history of NPS user fees

Today, there are three main funding sources proposed for the national parks: energy leasing revenues, taxing recreation equipment (a "gear tax"), and recreation fees (Smith & Banzhaf, 2004). Offshore lease revenues have supported the Land and Water Conservation Fund, which funds national parks. Gear taxes like the Pittman-Robertson and Dingell-Johnson Acts have generated over $1 billion annually for conservation. A gear tax makes economic sense when considering that individuals benefit from using their private goods (e.g., fishing rods) with public goods (e.g., public rivers). For this reason, gear taxes have been a successful source of conservation funding from hunters and anglers.

Because a gear tax requires delineating certain goods to be "recreation goods" used only with public goods, it can be hard to adapt this concept to outdoor recreation more generally. In some cases, like rock climbing gear, the delineation to recreation good is clear. But that the user bundles the private good (e.g., climbing rope) with the public good (e.g., Hyalite Canyon) is not so clear. The user could climb only inside her local gym. In this case, the gear tax is placed on a user who does not benefit from the investment. The concept becomes less straightforward when considering taxes on hiking gear – when is a hiking shirt used only on public lands? Instead, by charging user fees, the ambiguity of a gear tax is removed.

The use of user fees to fund recreation on public lands has a long, sometimes contentious, history. Mt. Rainier was the first park to charge user fees. In 1908, it allowed automobiles to drive inside the park, for a fee. The fees, charged per automobile, were intended to offset the cost of road construction, and they did. Many parks, including Glacier (1912), Yosemite (1913), and Yellowstone (1915), followed suit. This is an example of weak complementarity being utilized – an offsetting tax (the visitor fee) was

used to fund the provision of a public good (the roads) (Mäler, 1974; Smith & Banzhaf, 2004). Soon these parks were making enough money from the automobile and campground fees that pressure to decrease fees began mounting. The 1928 Department of Interior appropriations act ensured that none of the NPS appropriations will go to any site "wherein a charge is made or collected by the Park service for campground privileges" (Mackintosh, 1983). The choice was then either (i) collect fee revenue and forego central appropriations, or (ii) rely completely on central appropriations.

Few users believe that parks should be either fully funded through user fees, or that all parks should be free to use. Instead, the discussion is often over where, specifically, fees should be levied. This was not always the case, however. The first superintendent of Yellowstone National Park, Nathaniel P. Langford, proposed to Congress that the park would be fully self-supporting apart from an initial appropriation of federal funds to mark its boundaries. At this point in history, a self-supporting park was not a farfetched idea, and, indeed, Yosemite and Yellowstone earned profit in 1907 and 1915-1916, respectively (Mackintosh, 1983). It is worth noting that the gate fees of these times are not really comparable to today. The 1917 gate fee at Yellowstone was $7.50 (Rettie, 1995) – about $188 in 2025 – and the revenue stayed completely within Yellowstone. In 1965, the Land and Water Conservation Fund Act made the rule that per-vehicle entrance fees could not exceed $7, about $71 today. At the same time, all fee revenues were put into the Land and Water Conservation Fund (LWCF) and then distributed amongst all national parks according to a priority measure. For the next several decades, the LWCF would collect all user fees collected at NPS sites and distribute them across the units.

Collecting fees generates revenue, but parks incur some cost to do this. Consider an extreme example where a park sees none of the revenues it generates. In this case, there is no incentive to incur the collection cost. For this reason, understanding the role of managerial incentives on the efficiency of a national organization like the Service should not be underestimated. A classic example of managerial incentive-mismatch is revealed in the history of the Park and Recreation Revenue Act of 1982 which treated user fees as a "revenue enhancement" project, sending them to the General Fund of the Treasury (Rettie, 1995). While the fee increases did not act as a deterrent to visitation, the staffing and infrastructure costs to parks was non-trivial. Few managers were motivated to collect fees without guarantee of seeing much in return. The marginal benefit of an additional user fee did not exceed the cost. This practice was short-lived as the concept of using parks as remote revenue sources for a federal government is not only antithetical to the user pays/user benefits logic, and, perhaps more importantly, it fails to properly incentivize the enforcement of fee collection. In 1988, the law was changed so that

revenues returned to the LWCF. These experiences with centralized versus local control of fee revenues set the stage for the modern policy reforms that would fundamentally reshape park managers' incentives in the 1990s and 2000s.

2.2 Modern policy on user fees

1996 marked the first year that national parks were able to retain a significant portion of their collected user fees. The Recreational Fee Demonstration Program (Fee Demo) was enacted in section 315 of the Omnibus Consolidated Appropriations of 1996 in April of that year (Livingston, 1996), as a rider to a larger bill. This policy change significantly improved the incentive of park managers to collect recreation fees as 80% of these now remained at the site where it was collected. Prior to the act, all user fees were sent to the LWCF, where it was distributed by a central planner according to a ranked priority list. The Fee Demo was ensured for three years.

While the revenue was kept at the collection site, park managers did not have full control over the use of the funds. There were restrictions determined by the Service on how it could be spent. User fees could not be used to fund operations, they were to be used only to address maintenance and repairs, or to protect wildlife. According to then-comptroller of Yellowstone NP, Don Striker, this created "perverse incentives" that led to the closure of the Norris campground within the park (Striker, 2019). This campground earned more than enough fee revenue to cover its operating cost completely, but, because the fees could not be used for operations, the campground was closed. This is one of many anecdotes that help explain the 2004 repeal of the Fee Demo and enactment of the Federal Lands Recreation Enhancement Act (FLREA) in 2004.

The Fee Demo first allowed only 100 sites to collect user fees, but this was later relaxed. Initially authorized for three years, the Fee Demo was reauthorized annually from 1996 through 2003. Hence, it was never guaranteed to the park managers that they would be able to keep this revenue stream into the future. The introduction of FLREA did not change the fact that 80% of user fees remained at the site where they were collected, but it provided a lot more freedom on how that revenue was spent and guaranteed that park managers would be able to keep these revenues for at least ten years.

Compared to the annual reapproval process for the Fee Demo program, this kind of permanence gave park managers the kind of certainty required to make longer-term investments in infrastructure designed to attract visitors. FLREA also gave park managers more control over how those funds were spent. The differences between the Fee Demo

and FLREA are mainly based on this less-concrete uncertainty improvement and the more-concrete control of funds improvement. In addition, FLREA made the rule that all collection costs are covered by the user fees generated and created the Recreation Fee Program: a standardized framework for recreation fee collection and use. These changes represented a fundamental shift in managerial incentives: for the first time, park managers could make long-term infrastructure investments knowing they would retain both the authority to spend fee revenues and reasonable certainty about future funding streams.

FLREA formalized the ability of five agencies to earn revenue through fees at federal recreation lands and waters. These are the Bureau of Land Management (BLM), the Bureau of Reclamation, Fish and Wildlife Service (FWS), the National Park Service (NPS), and the Forest Service (FS). Of these, the NPS has consistently made a majority of the revenue, earning over 74% of total revenues in FY2023 (https://doi.sciencebase.gov/flrea/). The purpose was to use the fees for improvements at the sites where they were earned. Initially passed on December 8, 2004, FLREA was authorized for ten years (Vincent, 2023). Since its initial expiration date, FLREA has been continually reauthorized for several years at a time, but it does not have the relative permanence like the ten years after it was first enacted. It was recently authorized to continue through 2031 by the Expanding Public Lands Outdoor Recreation Experiences Act (Expanding Public Lands Outdoor Recreation Experiences Act, 2025).

2.3 FLREA details

According to the official report to Congress, surveys conducted by FLREA agencies reported that 80-90% of visitors were "satisfied with the fee paid for the services provided" (*Report to Congress*, 2009, p. 25) in the early days of FLREA. Consistently, the sites with fees are the most visited of all NPS sites. This is partially, a result of the NPS targeting which sites charge fees, but could potentially reflect visitation responses to increased site quality as the fee revenues are invested into the site. FLREA revenues from FY2003 through FY2008 made up between 17.2% and 23.3% of all NPS revenues (*Report to Congress*, 2009, p. 47).

As of 2023, 157 of the 429 NPS sites had any kind of FLREA fee collection. Between 2021 and 2023, the NPS had over 14.9 million reservations on Recreation.gov, earning over $316.8 million in FLREA revenues. In 2020, the agencies worked with Recreation.gov to implement timed entry services and vehicle reservation services online (*Report to Congress*, 2024). As of 2020, the NPS had a standardized point-of-sale system that

streamlined transactions, increasing accountability and decreasing overhead. Between 2018 and 2023, the average cost of collection as a percent of total revenue was 12.4% (*Report to Congress*, 2024).

The NPS has a tiered structure that could potentially create perverse incentives. Prior to 2022, NPS sites that collected less than $500,000 in recreation fees annually kept 100% of their fee revenues, but if a park collects more than this, it keeps only 80%; parks could also carry over up to 35% of the previous year's unobligated fee revenue. Starting in 2022, this number was increased to $750,000 and parks could keep 35% of a three-year rolling average of unobligated user fees. If the fees collected exceed the "reasonable needs" of a site that collects more than $750,000 in a year, that site only keeps 60% of its revenues, but I am unaware of any time this has happened.

3 Data

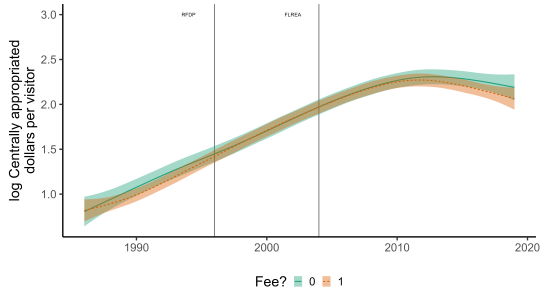
3.1 Data collection

The raw data for this research comes from two main sources: NPS budget justification documents and NPS visitor use statistics. The National Park Service develops and records a budget eight months before the start of each fiscal year (FY). The published documents, called "Green Books" or "budget justification hearings" are submitted first to the Department of the Interior, then to Congress for review and approval. The Green Books are the source of almost all of the outcome variables in this project. These include raw central appropriations and central appropriations per visitor for each park in each year, as well as centrally-funded full time equivalent employees (FTEs) and the plans for all construction projects at least two years in advance. The Green Books are published for FY1999 through FY2025, but the same variables can be found in budget justification hearings for FY1998 and before.

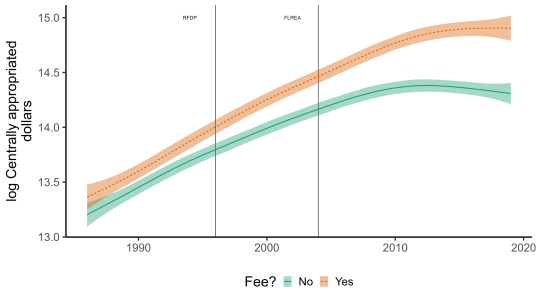
3.1.1 Budget data

The fifteen most recent budget justification documents can be downloaded from the NPS website (https://www.nps.gov/aboutus/budget.htm). I received budget documents from the years 1986 through 2009 from Eric Edwards and Sara Sutherland at PERC and UC Davis. The key variables taken from each budget justification include the dollar value of a park's yearly appropriations and construction projects. There are many more datapoints in the documents, but I found that these are the main variables which are economically

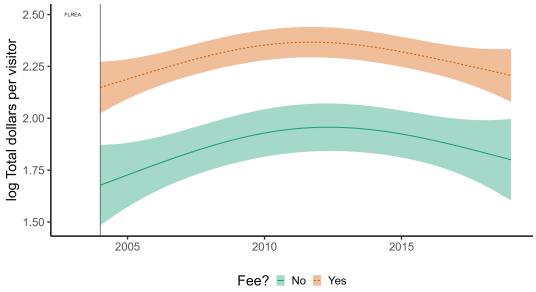
Figure 1: Raw data time series



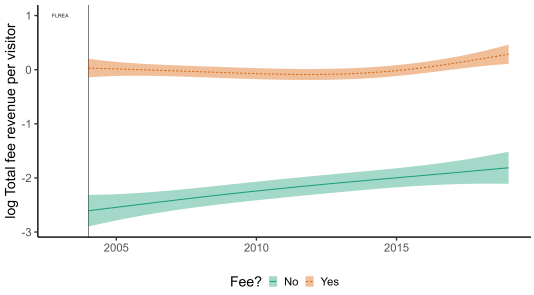
(a) Centrally appropriated funds per visitor



(b) Centrally appropriated funds



(c) Total budget (appropriation + revenue) per visitor



(d) Fee revenue per visitor

Note: These time series plots the average log dollars per visitor for parks, grouped by whether or not a park had an entrance fee in 2005, the first year that FLREA is hypothesized to take effect. Figure 1c and 1d were calculated using auxiliary data available only during the FLREA period (Wichman, 2024). Figure 1c suggests that fee-charging parks have a larger overall budget per visitor in the post-FLREA world. Figure 1d shows evidence that this larger budget is attributed to much larger revenue collection in parks with fees.

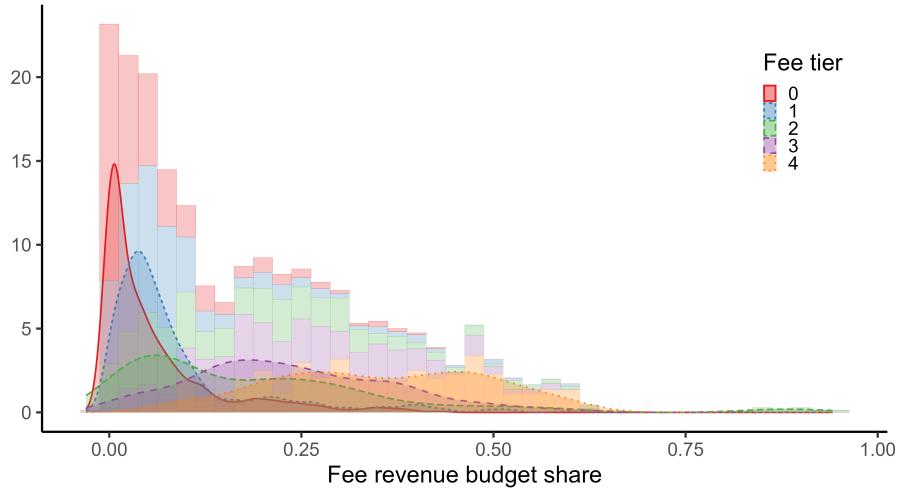


Figure 2: Share of budget collected through fees

Note: This shows the distribution of budget shares made up of fee revenues across the different fee tiers. The data is form 2004 through 2019 (Wichman, 2024) and is calcuated as $\frac{\text{fee revenue}}{\text{fee revenue} + \text{appropriation}}$. The no-fee parks (tier 0) have a share close to zero. This is because all of their fee revenue comes from additional amenities such as campgrounds. As we move up in tier, the distribution becomes more spread and the mean share becomes higher. Still, appropriations seem to make up a majority of most budgets.

important, provided at the park-level, and present in every year's publication.

The data are organized into tables within the budget justification documents: one for appropriations and one for construction. The tables were digitized by me through a combination of Optical Character Recognition (OCR) and manual transcription. For each budget justification document, I recorded the page numbers of the appropriations and construction tables. After creating this index, I send the PDFs of each table through a general processing algorithm that deskews the pages, sharpens the lines, and uses machine learning to "classify" each character.[2] I was also able to collect large paragraphs of text description for the construction projects; this text can be further analyzed to sort projects into purpose categories in the future.

Each table digitized through this process was then corrected by hand to ensure accurate data recordings.[3] The OCR worked well for recent documents, but those from earlier years required much more correction, sometimes being mostly transcribed by hand. The budget justification documents have much more information that can be extracted and used in future work.

[2]Conner Harwood at PERC helped a lot with this process.

[3]There are likely still mistakes in the data. Major mistakes were discovered and corrected during early data exploration.

3.1.2 Visitation data

Monthly visitation data for all National Parks were obtained through the visitor use statistics portal (http://https/://irma.nps.gov/STATS/) from 1979 through 2025. To avoid spurious results driven by the Covid-19 pandemic and to match the years for which I have budget data, I restrict my sample to span the years 1986 through 2019. At smaller parks, visitation is manually counted at entrance stations. At larger parks, visitation is calculated using a persons-per-vehicle multiplier. In this case, total visitation is calculated by multiplying this multiplier with the number of vehicles entering a park on a given day. Thus, visit counts are not perfectly measured, but the methodology is consistent within parks, so most measurement error will likely be absorbed by park fixed effects.

3.1.3 Fee and revenue data

A panel of park fee data was provided to me by a former PERC grad fellow Andrew Earle. This panel was provided to him by the NPS directly, and it covers 1993 through 2016, and 2022. Between 2017 and 2022, the parks service was not actively collecting fee information between 2017 and 2021.

To understand the relative importance of fee revenue, I used a post-FLREA panel of fee revenue data collected and used by Wichman (2024). The revenue data was only available from 2004 onward. As such, I cannot make causal claims of the effect that FLREA had on fee revenue, but figures 1c and 1d suggest that fee-charging parks generally earn higher total revenue after FLREA due to their fee collection. The difference in revenue collected per visitor is gradually increasing over time, with the parks that do not charge fees in 2005 increasing their fee revenue trend at an faster rate. This is using total fee revenue while the treatment is defined by entrance fees in 2005, so untreated parks are earning fee revenue either by enacting fees after 2005 (a small portion) or by charging fees for amenities like campsites (a majority).

Figure 2 shows that the relative importance of fee revenue increases as parks become larger. The share of total revenue collected by fees is less than 0.05 for parks in tier 0 and tier 1, with small variance. Parks in the higher tiers both earn a higher share of their total revenues by collecting fees and have higher variance, with fees for some tier 4 parks making up over half of their total revenue.

3.2 Data description

Fees are not the same for all parks, but they are quite standardized. Fee-charging parks are put into different tiers based on their fee. These tiers are very likely correlated with both appropriations and visitations. They act as an imperfect hierarchy of park importance to congress. As such, the treatment effect of FLREA likely varies across tiers, so I estimate the tier-specific treatment effects in addition to a baseline treatment effect of FLREA. The rules guiding a park's tier designation are defined in table 1 (*Report to Congress*, 2009).

Table 1: Park tier schedule

	Park type	Max. fee (vehicle/week)
Tier 0[a]	Any	\$0
Tier 1	Nat'l Hist. Site, Nat'l Mil. Park, Nat'l Battlefield Park, Nat'l Mem., Nat'l Shrine, Preserve, Parkway	\$10
Tier 2	Nat'l Seashore, Nat'l Rec. Area, Nat'l Monument, Nat'l Lakeshore, Nat'l Hist. Park	\$15
Tier 3	Nat'l Park	\$20
Tier 4	Nat'l Park	\$25

[a] Any park with no entry fee as of 2005 is automatically put into tier 0.

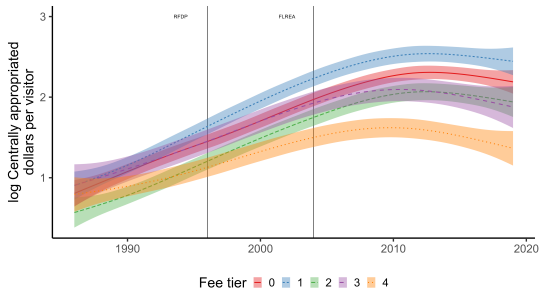
The trends in central appropriations per visitor are shown in figure 3a and central appropriations are shown in figure 3b. These figures show similar patterns to the binary treatment in figure 1, but the grouping by tiers highlights that tier 1 parks have higher appropriations per visitor compared to tiers 3 and 4. At the same time, parks in tiers 3 and 4 have much higher central appropriations for all years.

4 Empirical strategy

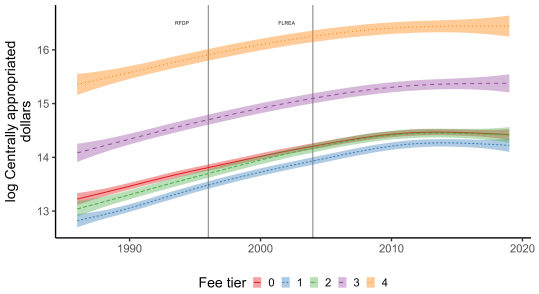
4.1 Research design

The main question of this research is whether FLREA caused a crowding out of federal appropriations to parks receiving increased fee revenue spending power. To address this question, I isolate variation in appropriation dollars, conditional on park and year fixed effects and park-specific time trends. Of course, there is the risk that these fixed effects and trends do not control for all omitted variables correlated with both user fee revenues and federal appropriations. We must interpret the results with this caveat in mind. Event studies for these outcomes are presented in figure 4. According to these figures, there is

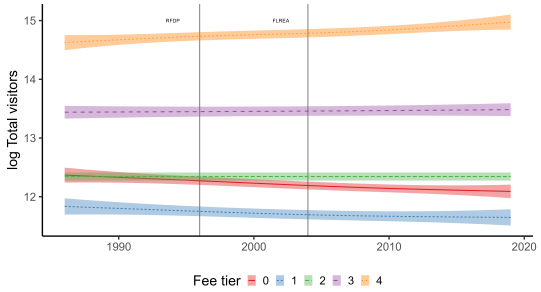
Figure 3: Data summary across tiers



(a) Central appropriations per visitor by tier



(b) Central appropriations by tier

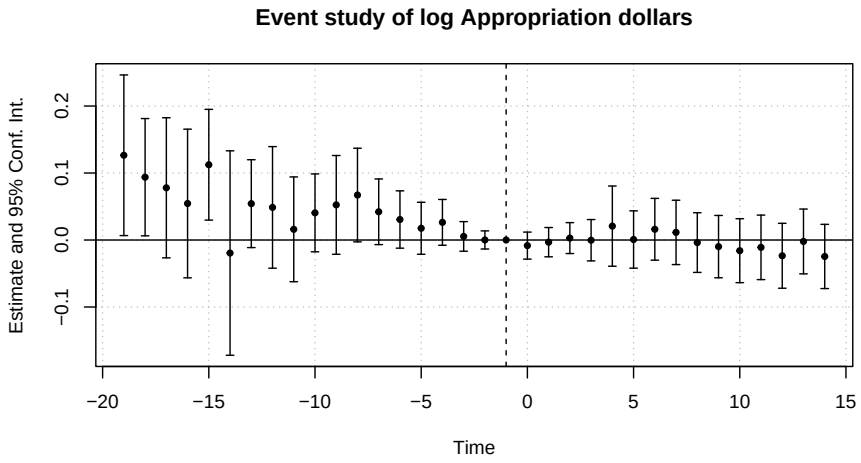


(c) Total visitors by tier

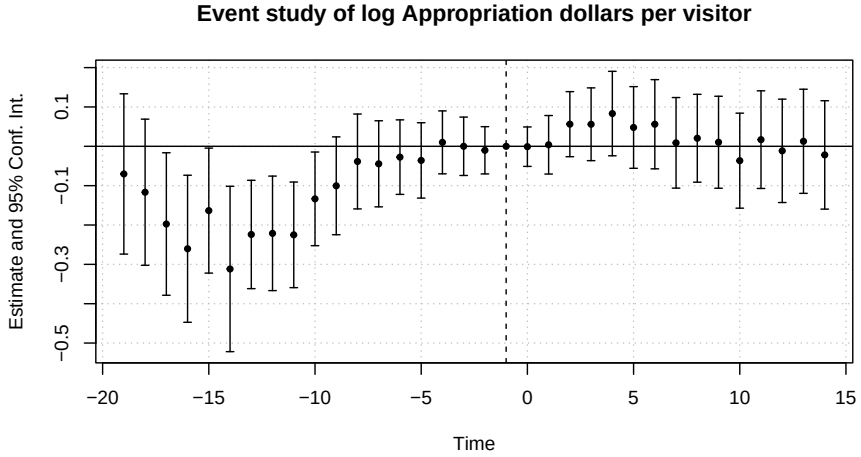
Note: Figure 3c shows that the visitation is relatively flat on a logged scale, so the growth does not fluctuate much. However, in more recent years, the largest national parks have had influx of visitation. Because this is a log scale, the trend line is still relatively flat.

no significant treatment effect of FLREA on the outcome. To investigate further, I focus on tier-specific treatment effects.

Figure 4: Event study outcomes



(a) Central appropriations



(b) Central appropriations per visitor

Note: The standard errors in all specifications are clustered at the park level. All coefficients are estimated with park and year fixed effects and park-specific time trends.

4.2 Difference in differences

I define a park's tier as the tier it belongs to just after FLREA goes into effect. The identifying assumption is that FLREA affects the park solely along this dimension. Formally, let the set of fee tiers be $\mathcal{M} = \{1, 2, 3, 4\}$. Each park i is assigned a tier $m \in \{\mathcal{M}, \emptyset\}$

where $m = \emptyset$ if the park charges no fees. (I represent the fact that park i is in tier m by saying $i \in m$.) Note that this research focuses only on entrance fees, so many parks in the empty set will in fact earn revenue through other channels (e.g., campsite reservations). As such, there is the potential for certain uncontrollable spillovers, but I do not believe these will bias results to a concernable degree. If anything, this will attenuate my treatment effect estimates.

A park's tier could be correlated with the appropriations it receives. For example, the highest fee tier is made up of the crown jewel parks including Yellowstone and Yosemite. These are subject to the "crown jewel effect" which gives the most congressional attention to the best and most famous parks (Rettie, 1995). I include park fixed effects to remove the crown jewel effect from confounding the estimates by looking at within-park variation.

To compare the simple effect of FLREA for all parks charging entrance fees in 2005, I estimate the following equation

$$\ln(Y_{it}) = \beta_1 \cdot 1(i \in \mathcal{M}) \cdot Post_t + \eta_i \cdot t + \phi_i + \psi_t + \epsilon_{it} \tag{1}$$

where Y_{it} is one of two outcomes of interest for park i in year t: federal appropriation dollars and federal appropriation dollars per visitor. The indicator $Post_t$ is equal to one every year after FLREA goes into effect. The fixed effects ϕ_i control for the many natural features which are constant over time and impact federal appropriations. A park's fee tier is perfectly collinear with the park fixed effect, so I cannot separately identify average tier-level average outcomes. The year fixed effects ψ_t control for macroeconomic fluctuations that impact appropriations. This prevents budget decreases due to the 2008 recession being attributed to FLREA. The coefficient β_1 identifies the difference in the outcome for fee-charging parks after FLREA compared to free-to-visit parks.

A simple comparison of fee-charging parks to non-fee-charging parks can be useful, but it is likely to mask a lot of the heterogeneity that guides appropriation and visitation (e.g., the crown jewel effect). The estimating equation for the tier-specific treatment effect is

$$\ln(Y_{it}) = \sum_{m \in \mathcal{M}} \beta_{1,m} \cdot 1(i \in m) \cdot Post_t + \eta_i \cdot t + \phi_i + \psi_t + \epsilon_{it} \tag{2}$$

where the fixed effects and outcome variables are the same as (1). Note that because the treatment (FLREA) occurs at the same time for all parks, the recent difference-in-differences literature does not threaten these results as much. The coefficient $\beta_{1,m}$ is the average difference in outcome for parks in tier m in the post-FLREA world after controlling for park and year fixed effects, relative to non-fee-charging parks.

4.2.1 Results

The results for the difference-in-differences are reported in two tables, separated by outcome variable. Table 2 shows coefficients for the oucome variable of total appropriation dollars, and table 3 shows coefficients for the outcome variable of total appropriations per visitor. The treatment is assigned in two ways: binary and tiered. In the binary treatment, all parks that charge entrance fees in 2005 (the year after FLREA is initiated) are grouped together; this is equation (1). In the tiered treatment, treatment effects are estimated for each tier; this is equation (2). I estimate the models with no fixed effects, with park and year fixed effects, and with park and year fixed effects and park-specific time trends. As expected, the fixed effects make a big difference. This is because there is a lot of heterogeneity in the way parks are perceived by congress, so each park has its own average appropriation which is very likely correlated with its fee tier. On top of the fixed effects, the park-specific trends makes a difference as well. Because the central appropriations are decided in the Washington DC office, park-specific time trends absorb the effect of a park superintendent's relationship with the central office. After controlling for park heterogeneity, the treatment effect is identified by changes in appropriations and visitors within parks across tiers/treatment. The coefficients and 95% confidence intervals for the tier-level FLREA effects for the the preferred specifications are presented in figures 5a and 5b.

The preferred specifications are presented in columns 3 and 6. Without park-specific time trends, there is a significantly negative effect on appropriation dollars, but the time trends remove this effect. Parks in tier 2 see a small increase in their average appropriation after FLREA (2.2%), but this is only significant at the 10-percent level. There is a general pattern that parks in tiers 1 and 2 have slightly positive FLREA effects and parks in tiers 3 and 4 have slightly negative FLREA effects. This is consistent with a transfer of appropriations from bigger, more fee-dependent parks to smaller, more appropriation-dependent parks; however, this is not a statistically significant result. I find no significant effects of FLREA on the appropriation dollars per visitor for the average fee-charging park in 2005 or at the tier-level.

4.3 Difference in different trends

The difference in average outcome before and after FLREA tells us the average effect of the policy. However, understanding the way that the policy affects *appropriation trends* is important as well because these pick up on longer, more lasting treatment effects. All of the raw data time series in figures 1 and 3 suggest that appropriations and appropriations

Table 2: FLREA effect on central appropriation levels

Dependent Variable:	log central appropriations					
	Binary treatment			Tiered treatment		
Model:	(1)	(2)	(3)	(4)	(5)	(6)
Variables						
Fee × Post	0.0822	-0.0463***	0.0127			
	(0.1294)	(0.0084)	(0.0111)			
Tier 1 × Post				0.1212	-0.0093	0.0236
				(0.1142)	(0.0108)	(0.0180)
Tier 2 × Post				0.1112	-0.0206***	0.0219*
				(0.1142)	(0.0074)	(0.0113)
Tier 3 × Post				0.0231	-0.1092***	-0.0168
				(0.1113)	(0.0175)	(0.0174)
Tier 4 × Post				-0.0778	-0.2119***	-0.0176
				(0.1044)	(0.0202)	(0.0165)
Fee	0.1368					
	(0.1075)					
Tier 1				-0.3151***		
				(0.1074)		
Tier 2				-0.0748		
				(0.1087)		
Tier 3				0.7707***		
				(0.1058)		
Tier 4				2.071***		
				(0.0999)		
Fixed-effects						
Park		Yes	Yes		Yes	Yes
Year		Yes	Yes		Yes	Yes
Park trends			Yes			Yes
Fit statistics						
Observations	10,344	10,344	10,344	10,344	10,344	10,344
R^2	0.09418	0.95774	0.97297	0.24453	0.95805	0.97298
Within R^2		0.00226	0.36199		0.00961	0.36215

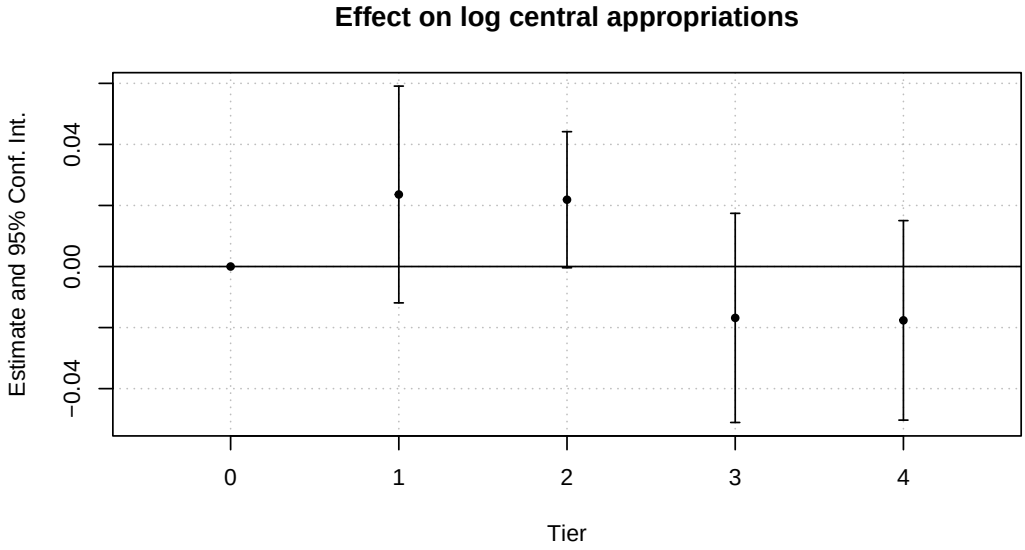
Clustered (Tier-Year) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Table 3: FLREA effect on central appropriation levels per visitor

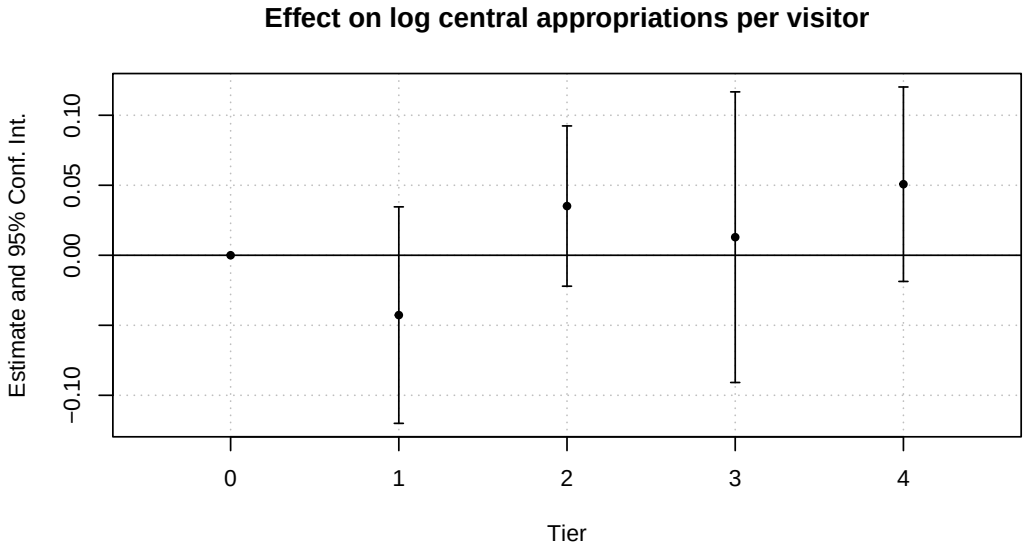
Dependent Variable:	log central appropriations per visitor					
	Binary treatment			Tiered treatment		
Model:	(1)	(2)	(3)	(4)	(5)	(6)
Variables						
Fee × Post	0.0177	0.1288***	-0.0015			
	(0.1111)	(0.0200)	(0.0282)			
Tier 1 × Post				0.1191	0.2138***	-0.0427
				(0.1322)	(0.0262)	(0.0392)
Tier 2 × Post				0.0586	0.1854***	0.0351
				(0.1241)	(0.0186)	(0.0290)
Tier 3 × Post				-0.1612	-0.0272	0.0129
				(0.1194)	(0.0312)	(0.0526)
Tier 4 × Post				-0.3491***	-0.2175***	0.0508
				(0.1059)	(0.0405)	(0.0352)
Fee	-0.0522					
	(0.0991)					
Tier 1				0.1427		
				(0.1271)		
Tier 2				-0.2757**		
				(0.1175)		
Tier 3				-0.0170		
				(0.1110)		
Tier 4				-0.3111***		
				(0.0964)		
Fixed-effects						
Park		Yes	Yes		Yes	Yes
Year		Yes	Yes		Yes	Yes
Park trends			Yes			Yes
Fit statistics						
Observations	10,344	10,344	10,344	10,344	10,344	10,344
R^2	0.07505	0.92102	0.95260	0.08732	0.92195	0.95262
Within R^2		0.00572	0.40324		0.01742	0.40348

Clustered (Tier-Year) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Figure 5: Difference in differences in outcome variable



(a) Effect of FLREA on appropriation dollars



(b) Effect of FLREA on appropriation dollars per visitor

Note: The standard errors in all specifications are clustered at the park level. All coefficients are estimated with park and year fixed effects and park-specific time trends.

per visitor follow persistent trends leading up to FLREA. In order to identify the impact of FLREA on these trends, I estimate the following regression

$$\ln(Y_{it}) = \beta_1 \cdot (i \in \mathcal{M}) \cdot (t - 2005) + \phi_i + \psi_t + \eta_i \cdot t + \epsilon_{it} \tag{3}$$

which is similar to (1). The interaction with $(t - 2005)$ sets the trend break at 2005, the first year that FLREA is hypothesized to effect budget trends. The corresponding estimating equation for the tiered trend break is

$$\ln(Y_{it}) = \sum_{m \in \mathcal{M}} \beta_{1,m} \cdot 1(i \in m) \cdot (t - 2005) + \phi_i + \psi_i + \eta_i \cdot t + \epsilon_{it} \tag{4}$$

where $\beta_{1,m}$ is the trend differential relative to 2005.

4.3.1 Results

Results for the difference in different trends models are presented in the same format as the difference in differences model. Table 4 reports the regression estimates for the outcome variable of log appropriations and table 5 reports the regression estimates for the outcome variable of log appropriations per visitor.

Table 4 reports the regression estimates for the outcome variable of log appropriations. The preferred specification includes park and year fixed effects and park-specific time trends; these results are in column (3) and (6) for binary and tiered treatment, respectively. In this specification, I find no significant shift in the average central appropriations trend for parks charging fees in 2005 after FLREA. I do, however, find that the tiers 1, 3, and 4 have decreased trend growth and tier 2 has increased trend growth. The effect on tier 3 parks is a decreased trend by 0.9%, but this is only statistically significant at the 10% level.

Table 5 reports the regression estimates for the outcome variable of log appropriations per visitor. Again, the preferred specification includes the same controls and are reported in the same columns as table 4. The binary treatment shows no significant affect of FLREA on this outcome. The model does, however, find significant negative effects at the tier-level on trends in appropriations per visitor. Parks in tiers 1, 2, 3, and 4 have decreases in appropriations per visitor trends of about 4.5%, 1.1%, 4.6%, and 1.9% respectively. Only the effect for tier 3 is statistically significant. One potential explanation for the null effect for the binary treatment is that a surge in visitation to the most popular parks around 2013 due to social media creates wide standard errors for tier 4 (Wichman, 2024). The surge may be drastic enough to cancel out the average

treatment effect.

I run robustness checks in which I omit years after 2012 and before 1997. This creates a shorter, balanced panel of 290 parks that removes pre-Fee Demo data and post-social media boom data. These are presented in appendix A where table 8 mirrors table 4 and table 9 mirrors table 5. With the shorter panel, I find no statistically significant changes to the appropriations trends. I do, however, find that parks who charged fees in 2005 had an increase in their trend of appropriations per visitor of about 7.7% on average while the tier-specific trends increased between 7.5% and 9.1%. I am not sure why the shorter, balanced panel makes such a significant difference, but I am open to suggestions.

The estimates suggest there is no significant trend break after FLREA for all fee-charging parks; this result is relatively precise. There is some evidence in different overall trends in appropriations and appropriations per visitor for fee-charging parks after FLREA, suggesting a potential re-arranging of NPS central budgets afterward, but the hypothesis that there is no re-arranging cannot be strongly rejected.

5 Discussion

This study provides the first rigorous empirical assessment of FLREA's impact on National Park funding, and the results offer cautiously optimistic news for policymakers. Drawing on over 10,000 park-year observations spanning 33 years, I find little evidence that increased local control over fee revenues led to reductions in federal appropriations. This implies that FLREA succeeded in providing additional funding rather than facilitating a pure transfer of existing resources. This finding challenges concerns that fee-based policies simply re-arrange current funding without providing additional benefits. But these are not purely "positive" results from a normative point-of-view. The absence of significant crowding out suggests that Congress has not systematically changed appropriations in response to improved efficiency in the use of fee revenues; budgets are not necessarily being re-optimized at a large scale in response to major policy changes. This might suggest inefficiencies in the way appropriations are assigned. If the local knowledge that park superintendents have allows them to use fee revenues more efficiently, then a transfer of appropriations from fee-collecting parks to non-fee-collecting parks could be a Pareto efficiency improvement.

The results reveal important economic mechanisms at work, but at a small scale. While I find no systematic crowding out across all parks, there is suggestive evidence of modest appropriation shifts from larger, more fee-dependent parks (tiers 3-4) to smaller,

Table 4: FLREA effect on trends in central appropriation

Dependent Variable:	log central appropriations					
	Binary treatment			Tiered treatment		
Model:	(1)	(2)	(3)	(4)	(5)	(6)
Variables						
Fee × Time	0.0042	-0.0030***	0.0097			
	(0.0062)	(0.0005)	(1,620.4)			
Tier 1 × Time				0.0062	-0.0011	-0.0276
				(0.0041)	(0.0008)	(0.0203)
Tier 2 × Time				0.0058	-0.0016***	0.0041
				(0.0043)	(0.0004)	(0.0050)
Tier 3 × Time				0.0012	-0.0062***	-0.0092*
				(0.0043)	(0.0011)	(0.0051)
Tier 4 × Time				-0.0047	-0.0122***	-0.0088
				(0.0041)	(0.0007)	(0.3485)
Time	0.0396***			0.0396***		
	(0.0030)			(0.0030)		
Fee	0.1938***					
	(0.0556)					
Tier 1				-0.2361***		
				(0.0360)		
Tier 2				-0.0012		
				(0.0381)		
Tier 3				0.7948***		
				(0.0360)		
Tier 4				2.036***		
				(0.0354)		
Fixed-effects						
Park		Yes	Yes		Yes	Yes
Time		Yes	Yes		Yes	Yes
Park trends			Yes			Yes
Fit statistics						
Observations	10,344	10,344	10,344	10,344	10,344	10,344
R^2	0.12785	0.95780	0.97294	0.27844	0.95815	0.97297
Within R^2		0.00368	0.36127		0.01209	0.36195

Clustered (Tier-Year) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Time is defined relative to 2005, the first year that FLREA effects are hypothesized to be observed.

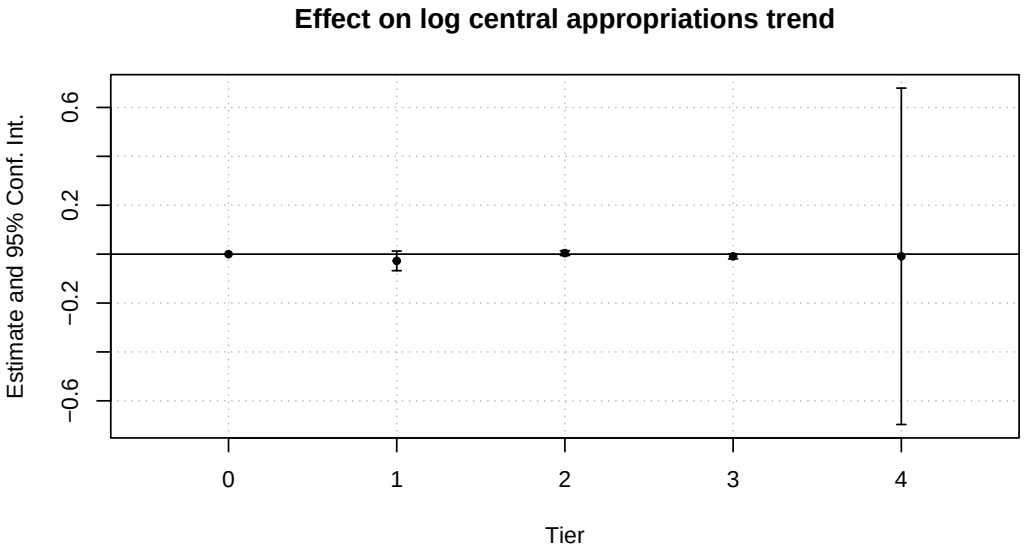
Table 5: FLREA effect on trends in central appropriation per visitor

Dependent Variable:	log central appropriations per visitor					
	Binary treatment			Tiered treatment		
Model:	(1)	(2)	(3)	(4)	(5)	(6)
Variables						
Fee × Time	0.0004	0.0076***	0.0379			
	(0.0044)	(0.0013)	(3,487.4)			
Tier 1 × Time				0.0069	0.0132***	-0.0455
				(0.0051)	(0.0012)	(0.0587)
Tier 2 × Time				0.0027	0.0104***	-0.0105
				(0.0050)	(0.0011)	(0.0123)
Tier 3 × Time				-0.0105*	-0.0018	-0.0457***
				(0.0055)	(0.0017)	(0.0128)
Tier 4 × Time				-0.0221***	-0.0136***	-0.0193
				(0.0048)	(0.0014)	(0.5754)
Time	0.0469***			0.0469***		
	(0.0033)			(0.0033)		
Fee	-0.0319					
	(0.0433)					
Tier 1				0.2235***		
				(0.0466)		
Tier 2				-0.2321***		
				(0.0457)		
Tier 3				-0.1021**		
				(0.0507)		
Tier 4				-0.5079***		
				(0.0454)		
Fixed-effects						
Park		Yes	Yes		Yes	Yes
Time		Yes	Yes		Yes	Yes
Park trends			Yes			Yes
Fit statistics						
Observations	10,344	10,344	10,344	10,344	10,344	10,344
R^2	0.09787	0.92116	0.95238	0.11067	0.92252	0.95260
Within R^2		0.00747	0.40056		0.02460	0.40324

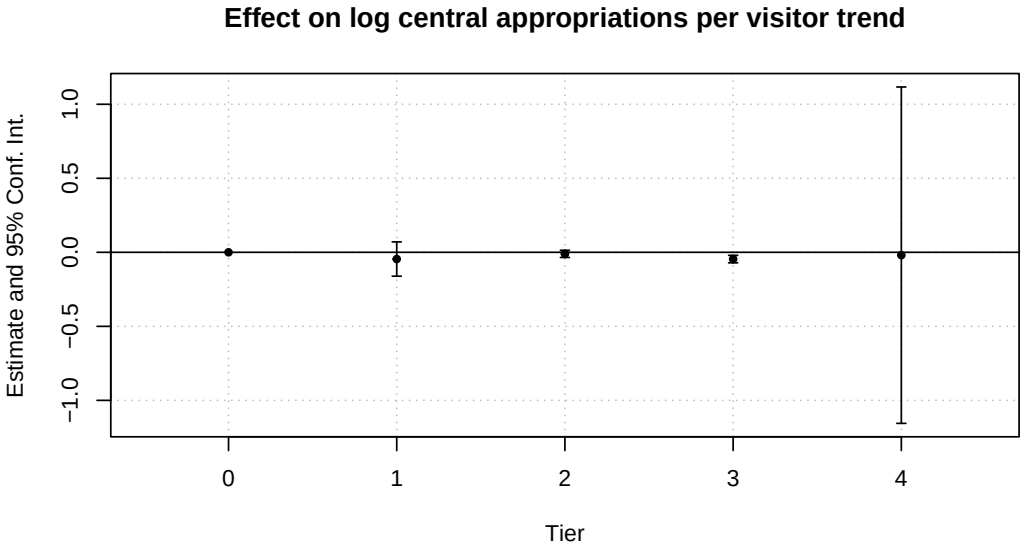
Clustered (Tier-Year) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Time is defined relative to 2005, the first year that FLREA effects are hypothesized to be observed.

Figure 6: Difference in different trends



(a) Effect of FLREA on the trend in appropriation dollars



(b) Effect of FLREA on the trend in appropriation dollars per visitor

Note: The standard errors in all specifications are clustered at the park level. All coefficients are estimated with park and year fixed effects and park-specific time trends.

more appropriation-dependent parks (tiers 1-2). This redistribution pattern suggests that Congress may be responding to FLREA by optimizing the allocation of scarce appropriated dollars by directing them where they're most needed, but it is not statistically signifiant.

Beyond the specific FLREA findings, this research illustrates the importance of examining both immediate and long-term policy effects. The difference in different trends analysis reveals that FLREA's impacts evolved gradually over time rather than appearing immediately. This nuanced pattern might not show up in a standard difference-in-differences analysis. This methodological insight has broader implications for evaluating public good policies and contract design, which often involve complex behavioral adjustments that unfold over multiple years.

The findings carry important implications for current and future policy debates. First, they suggest that expanding fee authority is unlikely to trigger significant appropriations reductions, making such expansions more politically feasible. Second, the evidence of gradual appropriation reallocation suggests that Congress may be slowly optimizing the distribution of funding, but this process could benefit by being made more explicit and faster. Third, the lack of strong crowding out supports arguments for permanent rather than temporary fee authority, as managers can treat allocations and fee revenue as complements, not substitutes.

Several important limitations qualify these conclusions. The analysis focuses primarily on entrance fees, while parks increasingly rely on diverse revenue streams including camping, permits, and concessions. While I find limited evidence of crowding out on average, this does not account for changes to non-entrance fee revenue. If appropriations respond to all fee revenue, then my results may be biased toward zero.

Ultimately, this research suggests that well-designed fee policies can expand rather than merely redistribute park funding; thus offering hope for addressing the mounting infrastructure crisis facing America's most treasured landscapes.

5.1 Future work

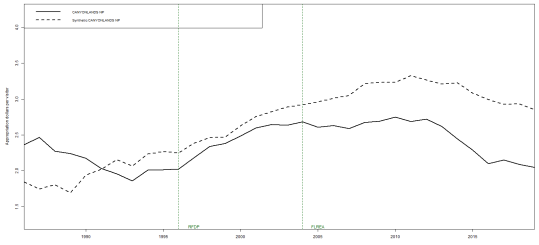
To make stronger claims about my results and to study different outcomes, there are a few extensions I suggest in the following sections. The first of these uses synthetic control methods to calculate park-specific FLREA effects. This exercise could use construction data collected from the budget justification documents to compare park-specific outcomes of interest like deferred maintenance. The second extension requires more data that is not currently publicly available, but could be a substantial contribution to the policy

discussion.

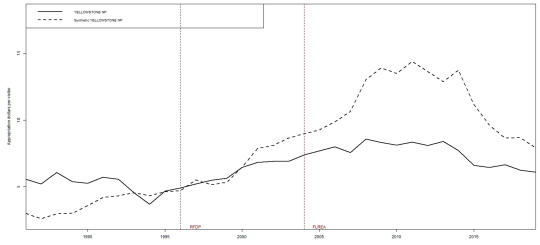
5.1.1 Synthetic control

In an ideal experiment, we would randomly "assign FLREA" to a subset of fee-charging parks and compare the outcome of the fee-charging parks *with FLREA* to the outcome of the fee-charging parks *without FLREA*. However, all fee-charging parks are assigned FLREA. Thus, this research is potentially well-suited for synthetic control. This may not be necessary, since figures 1a and 1b suggest that the non fee-charging parks may be a suitable control for parks affected by FLREA, but in order to study more heterogeneous outcomes such as construction and deferred maintenance, a synthetic control can be useful. I have estimated synthetic control for the fee-charging parks using appropriations per visitor as the outcome and presented a selection of time series of these in figure 7. The time series shows that suitable synthetic controls may be created, but it is unclear to me what the additional benefit of this is if the construction data does not have much useful variation.

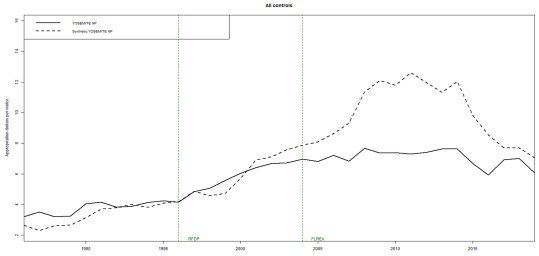
Figure 7: Synthetic controls for select tier 4 parks



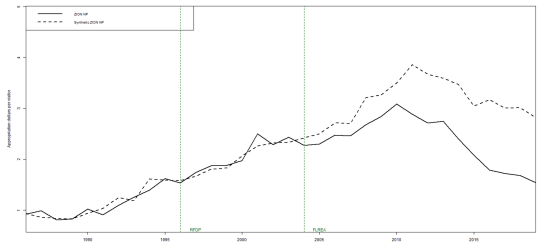
(a) Canyonlands NP



(b) Yellowstone NP



(c) Yosemite NP



(d) Zion NP

5.1.2 Elasticity of fee revenue substitution

Another compelling research question is whether federal appropriations are replaced by user fee revenue. The descriptive figures in the main text of this paper suggest that fee revenues provide a big safety net for parks to rely less on appropriations, but understanding the response of appropriations to increased fee revenue could be an essential part of the policy discussion. In this situation, the incentive of a park manager may not always be to increase user fee revenue because he or she may fear losing a valuable source of funding. Studying this question would require panel data on total fee revenue collected at parks. The NPS said this data can be obtained by FOIA request, but I was not able to collect it this summer.

To test the idea that changes in government appropriations are correlated with user fees, I could use the following estimating equation:

$$\ln(Y_{i,t}) = \beta \cdot \ln\left(\overline{UserFees}^{k}_{i,t}\right) + \phi_i + \psi_t + \eta_i \cdot t + \epsilon_{i,t}. \tag{5}$$

The outcome is the natural log of federal appropriations to park i in year t. The main explanatory variable is a moving average of past user fees, $\overline{UserFees}^{k}_{it}$ which is the average user fee collection at park i over the last k years. To address the risk that user fees are correlated with an unobserved site quality factor, and, if appropriations are targeted toward high quality sites, I include the park-level time trends $\eta_i \cdot t$ which picks up the effect of a park increasing its "quality." The remaining variation will reflect differences in visitation levels across parks and variation in economic factors; these are controlled for with the park fixed effect, γ_i, and the year fixed effect, τ_t, respectively. The error term $\epsilon_{i,t}$ is assumed IID with mean zero.

The coefficient β is the elasticity of federal appropriations with respect to previous user fee revenue. This replacement is reflected in the sign and magnitude of the estimand β. If $\beta < 0$, federal appropriations decrease as user fee revenue increases. Thus, unless there is a one-for-one replacement of appropriation with fee revenue with no uncertainty, managers may have incentive to earn less revenue for fear of losing their appropriations.

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A Empirical results with shorter panel

A.1 Replicating same dependent variables

The estimates in table 8 suggest a small, but precise, decrease in the trend in appropriations per visitor after FLREA. More precisely, parks that charged fees had a decrease in their appropriations growth of around 1.5%. The overall effect for all fee-charging parks in 2005 was negative, but this masks some important heterogeneity. Parks in tiers 1 and 2 had appropriations trend increases of 0.6% and 0.4%, respectively, while parks in tier 4 saw an appropriations trend decrease of about 0.9%. Meanwhile, parks that charged no fees in 2005 (tier 0) saw increases in their appropriations trends of about 0.5%.

A.2 Using baseline visitation

If we are concerned that visitation responds to FLREA, then using log appropriations per visitor could be including an endogenous control. To address this, I run auxiliary regressions using appropriations per baseline visitor level. This retains the "appropriations per visitor" interpretation, but removes the potentially endogenous visitor control. The baseline visitor level is the 1997 visitor levels, which is constant over time, but creates resonable comparison units to appropriations per visitor. The difference in differences results are presented in table 10 and the difference in different trends are presented in table 11.

The difference in differences results are qualitatively the same as those using the full, unbalanced panel. The difference in different trends suggest a similar impact, but at a larger scale. The average change in budget appropriations per 1997 visitor is about 1.5%. This is not the same for all parks that charge fees in 2005, however. The parks in tiers 1 and 4 saw in increase in their appropriations per visitor trend of 2.7% and 1.6%, respectively. At the same time, the parks in tiers 2 and 3 saw a decrease in appropriations per visitor of about 2% and 1.1%, respectively.

Table 6: FLREA effect on central appropriation levels

Dependent Variable:	log central appropriations					
	Binary treatment			Tiered treatment		
Model:	(1)	(2)	(3)	(4)	(5)	(6)
Variables						
Fee × Post	-0.0213	-0.0213**	0.0068			
	(0.1440)	(0.0085)	(0.0111)			
Tier 1 × Post				0.0098	0.0098	0.0105
				(0.0863)	(0.0091)	(0.0157)
Tier 2 × Post				-0.0072	-0.0072	0.0179
				(0.0862)	(0.0081)	(0.0151)
Tier 3 × Post				-0.0675	-0.0675***	-0.0180
				(0.0833)	(0.0103)	(0.0119)
Tier 4 × Post				-0.1371*	-0.1371***	0.0009
				(0.0758)	(0.0207)	(0.0134)
Fee	0.0917					
	(0.1162)					
Tier 1				-0.3651***		
				(0.0703)		
Tier 2				-0.1173		
				(0.0713)		
Tier 3				0.6921***		
				(0.0700)		
Tier 4				1.969***		
				(0.0642)		
Fixed-effects						
Park		Yes	Yes		Yes	Yes
Year		Yes	Yes		Yes	Yes
Park trends			Yes			Yes
Fit statistics						
Observations	5,600	5,600	5,600	5,600	5,600	5,600
R^2	0.03803	0.98097	0.98956	0.21427	0.98116	0.98956
Within R^2		0.00124	0.45217		0.01153	0.45240

Clustered (Tier-Year) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Table 7: FLREA effect on central appropriation levels

Dependent Variable:	log central appropriations per visitor					
	Binary treatment			Tiered treatment		
Model:	(1)	(2)	(3)	(4)	(5)	(6)
Variables						
Fee × Post	0.0407	0.0407***	0.0772***			
	(0.0909)	(0.0133)	(0.0205)			
Tier 1 × Post				0.0736	0.0736***	0.0767***
				(0.0898)	(0.0126)	(0.0266)
Tier 2 × Post				0.0977	0.0977***	0.0745***
				(0.0905)	(0.0144)	(0.0259)
Tier 3 × Post				-0.0485	-0.0485*	0.0769*
				(0.0913)	(0.0249)	(0.0404)
Tier 4 × Post				-0.1509*	-0.1509***	0.0912***
				(0.0779)	(0.0312)	(0.0310)
Fee	0.0238					
	(0.0751)					
Tier 1				0.2504***		
				(0.0804)		
Tier 2				-0.1883**		
				(0.0778)		
Tier 3				0.0162		
				(0.0812)		
Tier 4				-0.3631***		
				(0.0660)		
Fixed-effects						
Park		Yes	Yes		Yes	Yes
Year		Yes	Yes		Yes	Yes
Park trends			Yes			Yes
Fit statistics						
Observations	5,600	5,600	5,600	5,600	5,600	5,600
R^2	0.02282	0.95998	0.97581	0.03713	0.96032	0.97581
Within R^2		0.00126	0.39637		0.00988	0.39638

Clustered (Tier-Year) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Table 8: FLREA effect on trends in central appropriation

Dependent Variable:	log central appropriations					
	Binary treatment			Tiered treatment		
Model:	(1)	(2)	(3)	(4)	(5)	(6)
Variables						
Fee × Time	-0.0023	-0.0023	-0.0148***			
	(0.0020)	(0.0020)	(7.76×10^{-14})			
Tier 1 × Time				0.0007	0.0007	0.0055*
				(0.0029)	(0.0029)	(0.0030)
Tier 2 × Time				-0.0012	-0.0012	0.0036*
				(0.0024)	(0.0024)	(0.0020)
Tier 3 × Time				-0.0062**	-0.0062**	-0.0014
				(0.0028)	(0.0028)	(0.0016)
Tier 4 × Time				-0.0137***	-0.0137***	-0.0089***
				(0.0021)	(0.0021)	(0.0018)
Tier 0 × Time						0.0048***
						(0.0014)
Time	0.0409***			0.0409***		
	(0.0016)			(0.0016)		
Fee	0.0824					
	(0.1240)					
Tier 1				-0.3603***		
				(0.1314)		
Tier 2				-0.1199		
				(0.1481)		
Tier 3				0.6610***		
				(0.1710)		
Tier 4				1.907***		
				(0.2073)		
Fixed-effects						
Park		Yes	Yes		Yes	Yes
Time		Yes	Yes		Yes	Yes
Park trends			Yes			Yes
Fit statistics						
Observations	5,600	5,600	5,600	5,600	5,600	5,600
R^2	0.04726	0.98098	0.98956	0.22355	0.98123	0.98123
Within R^2		0.00204	0.45213		0.01494	0.01494

Clustered (Park) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Time is defined relative to 2005, the first year that FLREA effects are hypothesized to be observed.

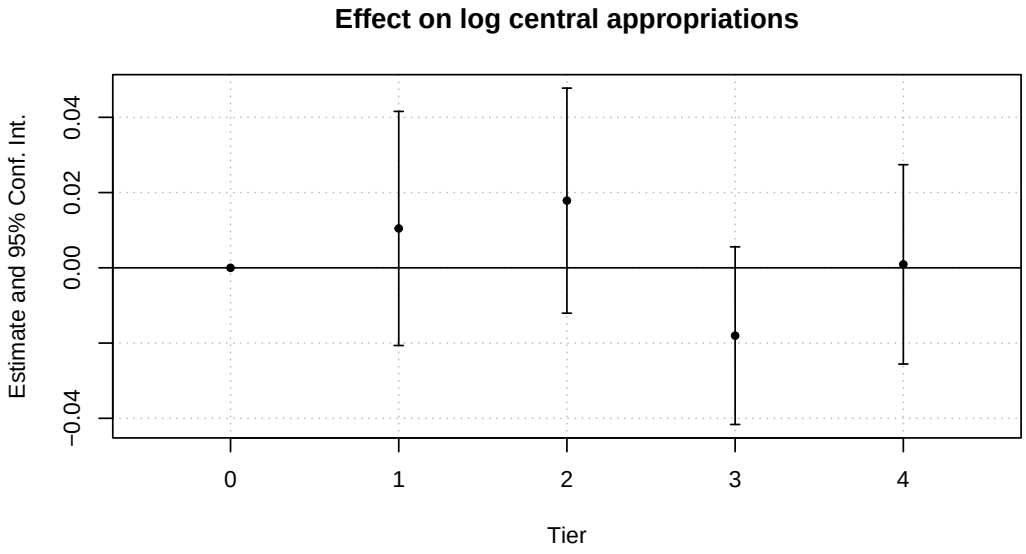
Table 9: FLREA effect on trends in central appropriation

Dependent Variable:	log central appropriations per visitor					
	Binary treatment			Tiered treatment		
Model:	(1)	(2)	(3)	(4)	(5)	(6)
Variables						
Fee × Time	0.0019	0.0019	-0.0867***			
	(0.0036)	(0.0036)	(6.4×10^{-13})			
Tier 1 × Time				0.0052	0.0052	0.0100**
				(0.0046)	(0.0046)	(0.0048)
Tier 2 × Time				0.0077	0.0077	0.0125***
				(0.0053)	(0.0053)	(0.0044)
Tier 3 × Time				-0.0070	-0.0070	-0.0023
				(0.0047)	(0.0047)	(0.0028)
Tier 4 × Time				-0.0176***	-0.0176***	-0.0129***
				(0.0038)	(0.0038)	(0.0031)
Tier 0 × Time						0.0047**
						(0.0024)
Time	0.0377***			0.0377***		
	(0.0028)			(0.0028)		
Fee	0.0454					
	(0.1596)					
Tier 1				0.2867		
				(0.1962)		
Tier 2				-0.1413		
				(0.2035)		
Tier 3				-0.0025		
				(0.2700)		
Tier 4				-0.4272*		
				(0.2275)		
Fixed-effects						
Park		Yes	Yes		Yes	Yes
Time		Yes	Yes		Yes	Yes
Park trends			Yes			Yes
Fit statistics						
Observations	5,600	5,600	5,600	5,600	5,600	5,600
R^2	0.02564	0.95994	0.97576	0.04010	0.96043	0.96043
Within R^2		0.00039	0.39511		0.01263	0.01263

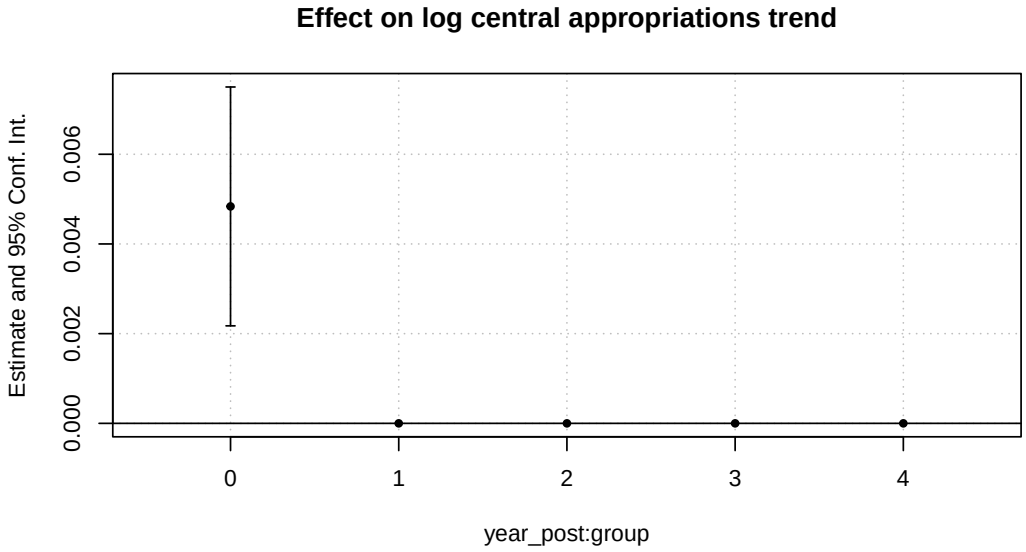
Clustered (Park) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Time is defined relative to 2005, the first year that FLREA effects are hypothesized to be observed.

Figure 8: Tier effects on central appropriations (short, balanced panel)



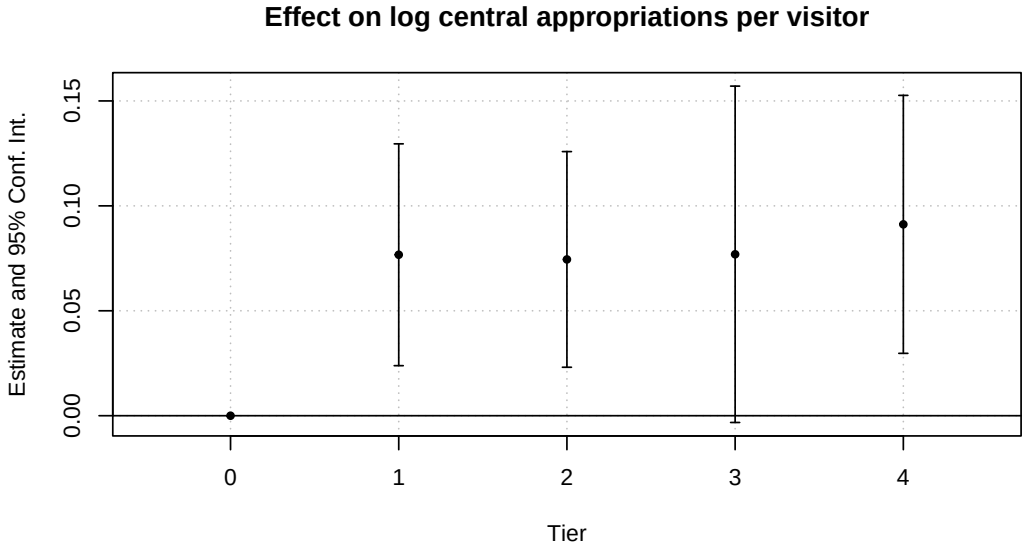
(a)



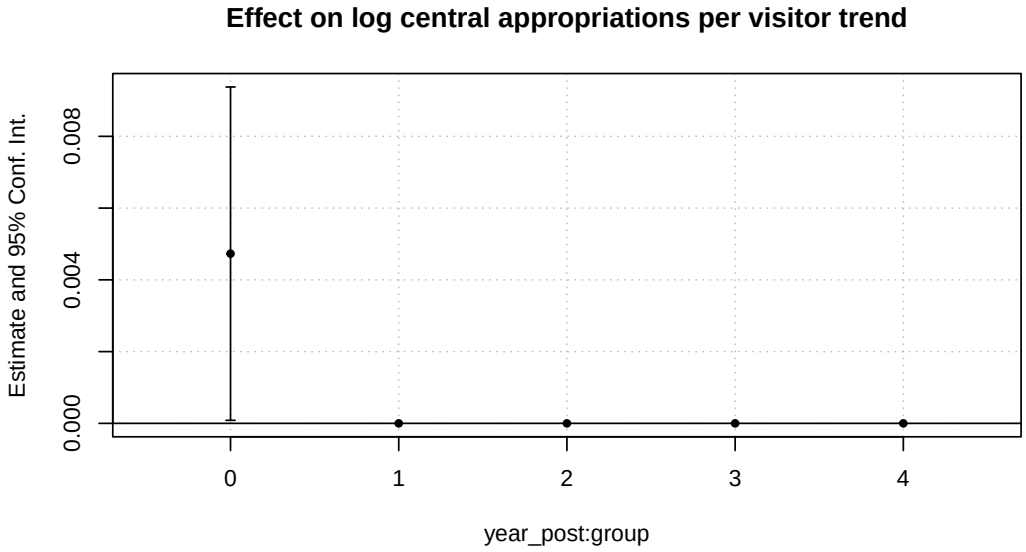
(b)

Note: The standard errors in all specifications are clustered at the park level. All coefficients are estimated with park and year fixed effects and park-specific time trends.

Figure 9: Tier effects on central appropriations per visitor (short, balanced panel)



(a)



(b)

Note: The standard errors in all specifications are clustered at the park level. All coefficients are estimated with park and year fixed effects and park-specific time trends.

Table 10: FLREA effect on central appropriation levels per 1997 visitors

Dependent Variable:	log central appropriations per 1997 visitor					
	Binary treatment			Tiered treatment		
Model:	(1)	(2)	(3)	(4)	(5)	(6)
Variables						
Fee × Post	-0.0213	-0.0213**	0.0068			
	(0.0931)	(0.0085)	(0.0111)			
Tier 1 × Post				0.0098	0.0098	0.0105
				(0.0863)	(0.0091)	(0.0157)
Tier 2 × Post				-0.0072	-0.0072	0.0179
				(0.0862)	(0.0081)	(0.0151)
Tier 3 × Post				-0.0675	-0.0675***	-0.0180
				(0.0833)	(0.0103)	(0.0119)
Tier 4 × Post				-0.1371*	-0.1371***	0.0009
				(0.0758)	(0.0207)	(0.0134)
Fee	-0.0709					
	(0.0747)					
Tier 1				0.1581**		
				(0.0703)		
Tier 2				-0.3044***		
				(0.0713)		
Tier 3				-0.0581		
				(0.0700)		
Tier 4				-0.4364***		
				(0.0642)		
Fixed-effects						
Park		Yes	Yes		Yes	Yes
Year		Yes	Yes		Yes	Yes
Park trends			Yes			Yes
Fit statistics						
Observations	5,600	5,600	5,600	5,600	5,600	5,600
R^2	0.02168	0.98920	0.99408	0.03542	0.98931	0.99408
Within R^2		0.00124	0.45217		0.01153	0.45240

Clustered (Tier-Year) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

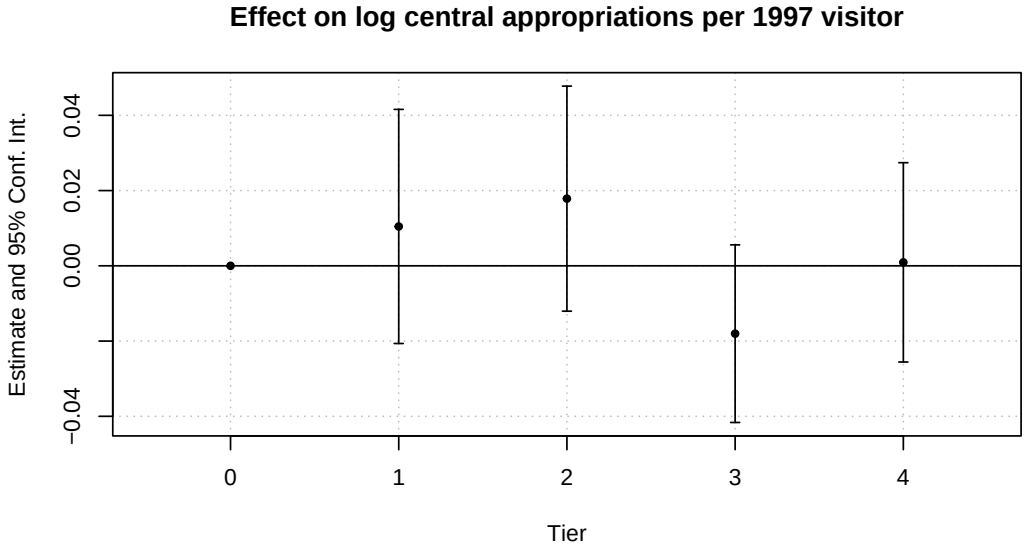
Table 11: FLREA effect on trends in central appropriation per 1997 visitors

Dependent Variable:	log central appropriations per 1997 visitor					
	Binary treatment			Tiered treatment		
Model:	(1)	(2)	(3)	(4)	(5)	(6)
Variables						
Fee × Time	-0.0023	-0.0023	-0.0148***			
	(0.0020)	(0.0020)	(7.81×10^{-14})			
Tier 1 × Time				0.0007	0.0007	0.0270***
				(0.0029)	(0.0029)	(0.0055)
Tier 2 × Time				-0.0012	-0.0012	-0.0200***
				(0.0024)	(0.0024)	(0.0037)
Tier 3 × Time				-0.0062**	-0.0062**	-0.0114**
				(0.0028)	(0.0028)	(0.0051)
Tier 4 × Time				-0.0137***	-0.0137***	0.0164***
				(0.0021)	(0.0021)	(0.0016)
Time	0.0409***			0.0409***		
	(0.0016)			(0.0016)		
Fee	-0.0802					
	(0.1642)					
Tier 1				0.1629		
				(0.1984)		
Tier 2				-0.3069		
				(0.2134)		
Tier 3				-0.0892		
				(0.2706)		
Tier 4				-0.4981**		
				(0.2326)		
Fixed-effects						
Park		Yes	Yes		Yes	Yes
Time		Yes	Yes		Yes	Yes
Park trends			Yes			Yes
Fit statistics						
Observations	5,600	5,600	5,600	5,600	5,600	5,600
R^2	0.02692	0.98921	0.99407	0.04068	0.98935	0.99407
Within R^2		0.00204	0.45213		0.01494	0.45213

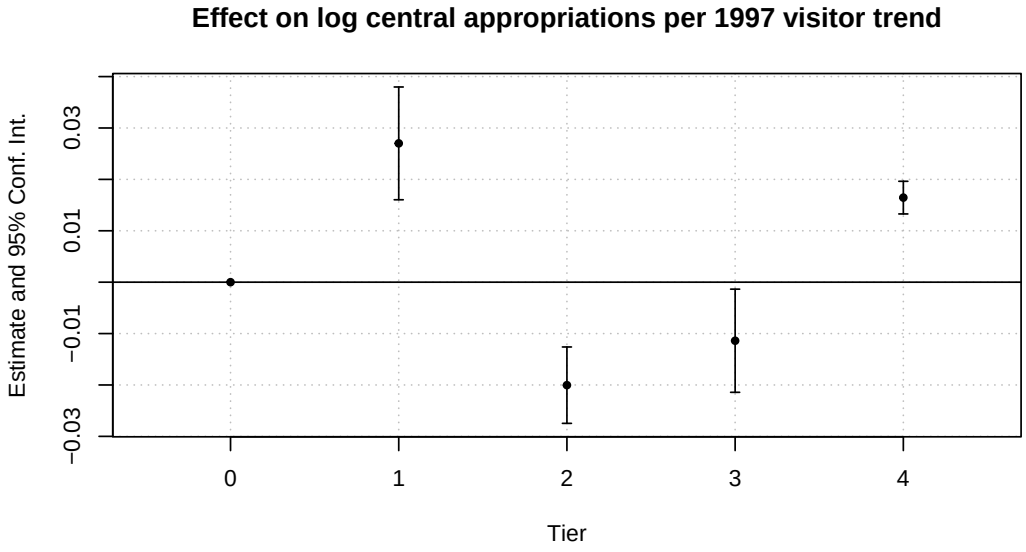
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Time is defined relative to 2005, the first year that FLREA effects are hypothesized to be observed.

Figure 10: Tier effects on central appropriations per 1997 visitors (short, balanced panel)



(a)



(b)

Note: The standard errors in all specifications are clustered at the park level. All coefficients are estimated with park and year fixed effects and park-specific time trends.