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Political Economy of Infrastructure Investment: Evidence from the Economic Stimulus Airport Grants

Abstract

We study impact of the political factors behind allocation of airport infrastructure grants under the American Recovery and Reconstruction Act (ARRA) of 2009. We find that – controlling for other factors – airports located in the districts with the larger Obama-McCain vote differential in November 2008 election received larger ARRA grants. At the same time, the district level election results are poor predictors of *whether* an airport will receive the grant. Senators' party affiliation and representatives' membership in the House Committee on Transportation and Infrastructure also appear as factors explaining allocation of the ARRA grants to the airports, especially in the State level analysis.

Keywords: American Recovery and Reinvestment Act; Airport Infrastructure Investment; Airport Improvement Program.

JEL Codes: P16, H54, R48

1. Introduction

The federal government plays a crucial role in the infrastructure investment in the United States, including allocation of funds to the airports. As airports are perceived to bring substantial benefits to the respective communities, federally funded airport infrastructure projects are both sought after, welcomed, and should be beneficial to the politicians capable of securing the funds. Complicated structure of the American political system creates possibilities for strong influence of political factors on the process of allocation of infrastructure investment funds.

This study offers the first look at the issue of impact of political factors on the aviation infrastructure investment in the USA. We take advantage of the American Recovery and Reinvestment Act (ARRA) of 2009 (more broadly known as the Stimulus) to examine contribution of political factors to allocation of the \$1.1 billion worth of the airport grants included into the package. The Stimulus provides an excellent case for studying political economy of airport (and more generally, infrastructure) investment, as far as involvement of the federal government is concerned. The law was set up rather hastily – Barack Obama was elected President in November of 2008, inaugurated on January 20, 2009, and ARRA became law on February 17, 2009. The criteria for the airport infrastructure projects to be funded under the ARRA were rather vague,¹ and the number of candidate projects clearly exceeded what could have been funded.² We can therefore suspect that the airport infrastructure grants could have been used by the Administration, or the Congress as a mechanism to reward districts which brought more votes in the latest election. Additionally, members of the corresponding Congress Committees (in particular, of the House Committee on Transportation and Infrastructure) might have used ARRA as an opportunity to bring more money to their districts.

Examining politics behind the allocation of ARRA funds allows us to take a look at the politics behind distribution of the federal funds somewhat outside of the usual 'repeated game' context. Most of the funds have been distributed directly to the airports

¹ ARRA expressed preference for projects that could be completed within two years. FAA set a (technically non-binding) National Priority Rating (NPR) threshold of 62 out of 100 for projects to be considered for ARRA grants. Normal NPR threshold for regular Airport Improvement Program projects is 40-42 out of 100. See Section 2 of the paper for more details.

² This point is explicitly acknowledged in *FAA Stakeholder Guidance*, American Recovery and Reinvestment Act (ARRA) of 2009, June 9, 2009

through a federal agency (Federal Aviation Administration). This is quite different from the usual pork barrel scheme, whereby votes are traded in exchange for appropriations for the pet projects included directly into the legislation.

Our data analysis showed association between the airport's location in the Congressional District with the larger Obama-McCain vote differential in November 2008 Presidential election, and the amount of the ARRA grant received by the airport. At the same time, district level election results are poor predictors of whether the airport receives the grant; and estimation results are not entirely robust to taking election results from the adjacent districts into consideration. We also detect rather robust evidence of the impact of Senate on the grant allocation process.

This paper contributes to the literature on public provision of infrastructure. Research in this area has been addressing the issues of both *effects* of the publicly provided infrastructure on private sector productivity, and the *determinants* of the infrastructure investment. The former literature (e.g., Aschauer, 1989; Holz-Eakin, 1994) is much richer than the latter. Studies of the determinants of public infrastructure investment include Cadot et al. (2006), Castells and Sole-Olle (2005), Kemmerling and Stephan (2002, 2008), Fridstrom and Elvik (1997), Bel and Fageda (2009). All the listed papers study infrastructure investment in Europe, and the latter has the most relevance to our paper, as it examines (and confirms the existence of) the impact of political factors on airport investment in Spain. On the US side, we find a lot of studies asserting the disproportionate power of the Senate³ (e.g., Hoover and Pecorino, 2005) and Congressional Committees (e.g., Garrett et al., 2006) in allocation of the federal funds across the jurisdictions. Garrett and Sobel (2003) find that states which are politically important to the President will have a higher rate of the disaster declaration; the authors also find the election year effects on the amounts of the Federal Emergency Management Agency (FEMA) disaster payments. The only studies of political determinants of transport infrastructure investment in the US are McFadden (1976) – an examination of project choices by California Division of Highways, finding limited impact of political

³ The US Congress consists of the House of Representatives and the Senate. While representation in the former is proportional to population; Senate includes two representatives from every State. The literature suggests that less populous states have disproportionate bargaining power under such circumstances.

determinants on the selection process; as well as Knight (2004), asserting that congressmen respond to common pool incentives when voting for transportation projects.

The rest of the paper is organized as follows. Section 2 discusses the relevant institutional details, including description of the airport infrastructure finance in the USA, and an outline of the American Recovery and Reinvestment Act of 2009. Section 3 presents the data. Section 4 outlines the data analysis methodology and reports the results, and Section 5 concludes.

2. Institutions

2.1 Airport Infrastructure Funding in the USA

Airport infrastructure in the United States is financed via five sources: bonds, State and local grants, passenger facility charges, and Airport Improvement Program (AIP) grants. This system has been finalized in the early 1990s, when airports have been allowed to levy the passenger facility charges.

The current regulatory framework US airports operate under is defined by the following pieces of legislation. The Airport and Airways Improvement Act of 1982 established the present Airport Improvement Program, and mandates that any airport accepting AIP grants charge reasonable fees to its aeronautical users. The Final Policy Regarding Airport Rates and Charges, issued by the FAA in 1996, establishes that the fees charged by the airports to its aeronautical users be cost-based. Finally, the 1994 FAA Authorization Act requires that airports be self-sustainable.

The AIP is a \$3 billion a year program, through which an airport can obtain a federal grant for the projects involving land acquisition, as well as construction or improvement of the airport infrastructure⁴. Grants are available for both publicly owned and private designated reliever airports. Note that over eighty percent of the public access airports in the United States are publicly owned. Over the last five fiscal years (2005-2009), more than 1800 airports in the USA have made use of the AIP grants. An important function of the Airport Improvement Program is to ensure cost-based charges

⁴ AIP funding is limited to improvements related to aircraft operations, typically for planning and construction of projects such as; runways, taxiways, aprons, noise abatement, land purchase, as well as security, safety, or emergency equipment.

for the aeronautical services provided by airports. An airport suspected of overcharging its airline customers risks losing its access to the AIP funds.

The distribution system for the AIP grants is complex, and includes a combination of the formula and discretionary grants. Each eligible airport is appropriated a certain amount out of the aviation trust fund, based primarily on the volume of aviation services provided (formula grants); and can compete for the non-appropriated funds (discretionary grants). The Federal Aviation Administration prioritizes the bids for non-appropriated funds according to the National Priority Ranking (NPR). NPR for each project is calculated according to the FAA developed model, which produces values between 0 and 100, “in accordance with the agency’s goals and objectives”⁵. According to the FAA, “NPR is used in conjunction with qualitative factors including state and local priorities, environmental issues, impact on safety and performance, airport growth, pavement condition index, and others”.

Since 1992, the commercial service airports (those enplaning more than 2,500 passengers per year and operating scheduled airline services) have been allowed to collect passenger facility charges (PFC). These charges are added to the airline ticket prices, and may not exceed \$4.50 per passenger, and \$18 per round-trip ticket. In 2008 PFC added up to over \$2.6 billion. Passenger facility charges are collected to fund federally approved airport infrastructure projects; they do not replace AIP grants. Rather, airports apply to FAA for the right to collect PFC for specific projects. Applications are typically approved – according to FAA, as of October 1, 2012, PFCs are levied at 385 airports, and only five applications have been turned down by the agency since the inception of the program.

Interestingly, the use of PFC is at odds with the International Civil Aviation Organization’s (ICAO) recommendation that aircraft weight-based rather than per passenger charges be used for infrastructure financing. IATA, however, disagrees with ICAO on this point, advocating per passenger charges. This viewpoint is understandable, as IATA is an airline industry association. Czerny and Zhang (2015) and Czerny et al. (2016) both suggest that per passenger charges are generally less preferred from the welfare point of view as compared to the aircraft weight based fees.

⁵ See http://www.faa.gov/airports/aip/grant_histories/airport_projects/ for more information.

2.2 American Recovery and Reinvestment Act

Our study deals with the funds appropriated to the Federal Aviation Administration (FAA) for the airport infrastructure projects under the American Recovery and Reinvestment Act of 2009. The Act was signed into law by President Barack Obama on February 17, 2009, and was the first major piece of legislation adopted by the 111th US Congress. Passage of the ARRA was preceded – and precipitated – by the worst recession in the USA since the Great Depression.⁶ The economic stimulus bill was one of the important items on candidate Obama’s election agenda. Passage of ARRA was in part facilitated by fact that in November 2008 election Democratic Party gained control of both Houses of the US Congress. The economic stimulus provided by the ARRA totaled \$787 billion, roughly evenly split between the tax cuts; education, healthcare and other entitlement programs; and the federal contracts, grants and loans⁷. Our study examines a small portion of funds falling into the latter category – almost \$1.1 billion made available to the FAA for Grants in-aid for airports.

According to the FAA, for the ARRA projects the agency raised its NPR threshold from the usual 40-42 to 62, emphasizing the need to cover the entire country and putting a somewhat higher priority on the renovation or replacement of the aging terminal infrastructure at the smaller airports. At the same time, the agency did reserve the right to fund the lower ranked projects “on a case-by-case basis so long as they are justified in writing to the satisfaction of the FAA”. Further, the agency indicated it would give preference to projects which could be completed within two years. Projects planned for AIP spending in the next fiscal year have been excluded from the ARRA funding. In the Guidance document issued by the FAA in relation to the ARRA funds, the agency stated that the number of potential projects meeting basic requirements for funding exceeded the available funds.

⁶ According to the National Bureau of Economic Research, recession lasted from December of 2007 till July of 2009. In the course of the recession, unemployment rate in the US exceeded 10 percent for the first time in over twenty years.

⁷ Detailed information is available on the web-site www.recovery.gov established by the US Government and dedicated to ARRA.

3. Data

For our analysis, we combine data on various operating characteristics for the population of over 2000 public access airports; information on Stimulus grants appropriated to the airports; election results along with information on the composition of the Senate; as well as the relevant demographic variables.

As of September 30, 2009 (the cutoff date for the data used in our analysis), the FAA appropriated \$1.04 billion of the ARRA funds among over 300 projects. The project-level data has been obtained from the FAA web-site. Each entry in the dataset includes information about the location of the project; project number and description of the grant; total grant amount; project's NPR; and the corresponding Congressional District number. We have aggregated this data by the unique project number. This resulted in 309 projects, covering 274 locations. Of those projects, 275 could be linked to 235 existing airports located in 191 (out of 435) different Congressional Districts across all fifty states. The focus of our study will be on these very projects. Table 1 below reports the descriptive statistics of the ARRA projects in our dataset.

Table 1 Descriptive statistics of ARRA airport projects

	Mean	Standard deviation	Minimum	Maximum
ARRA grant total	\$3,363,704	\$3,360,659	\$94,775	\$15,000,000
Runway construction or rehabilitation grants	0.336	0.473	0	1
Taxiway construction or rehabilitation grants	0.183	0.388	0	1
Terminal construction or expansion grants	0.055	0.228	0	1
Apron rehabilitation grants	0.110	0.313	0	1
Project NPR	65.71	13.06	31	98

Source: Calculated based on information obtained from FAA

A striking fact from the above table is the low average value of the project NPR. We indicated above that the FAA claimed to have set the NPR threshold at 62 out of 100 for ARRA grants; reserving the right to approve projects below this lower limit. It appears from our dataset that the agency has used this discretion quite a bit: 65 projects (21 percent of the total) in our dataset have NPR below 62; eighteen projects had NPR below 40, which is the cut-off for the regular AIP program (however, of AIP projects funded over 2005-2009, about fourteen percent had NPR below 40). Note that we only observe *approved* projects, so that we do not observe NPR of projects that were not approved for

funding. This unfortunately does not allow us to conduct the kind of analysis McFadden (1976) implemented.

The airport-level data (also obtained from FAA) include area occupied by the airport; number and average length of the runways; and the total number of operations at the airport (including commercial, general aviation, military and other flights) in 2009. We also have included the data on AIP grants received by the airport over the last five fiscal years. These statistics are available for up to 2046 public access airports.

Table 2 presents descriptive statistics for the airport-level variables. We present these data for both the entire sample of airports, and the ARRA grant recipients.

Table 2 Descriptive statistics for the airport-level variables

	Entire sample		ARRA grant recipients	
	Mean	Standard deviation	Mean	Standard deviation
Airport land area, acres	726.56	1,379.93	1,890.52	2,995.14
Number of runways	1.686	0.913	2.357	1.323
Average runway length, feet	4,766.97	1,714.56	6,126.62	1,939.19
Total operations	40,870.50	70,570.19	98,065.55	133,155.10
Average operations per runway	21,901.68	26,949.56	36,199.02	31,877.95
Total AIP grants, 2005-2009	\$14,585,454	\$98,279,354	\$44,964,023	\$81,820,192
Number of airports	2046		235	

Source: FAA

We can see from Table 2 that the airports selected to receive ARRA grants are larger than average, by all parameters. This does not necessarily mean, however, that the FAA did not live up to its declared emphasis on smaller airports. The population of public access airports includes many small airfields, and “smaller” by the FAA definition for the purposes of the ARRA grants might simply mean smaller commercial airports.

Demographics data is crucial for the following reason. One way we might observe the correlation between election results which brought a Democratic candidate to The White House and the amount of funds allocated to the airports is that both airports and the Democratic Party electorate might be located in urban areas. As measures of the area demographics, we use the latest available numbers for the county level population, congressional district level per capita income, and State level population. State level population is used to account for the potential disproportionate impact of smaller States on allocation of Federal funds.

District level results of the November 2008 US House of Representatives election have been obtained from the web-site of the House of Representatives. The district-level data for the November 2008 presidential elections have been compiled by Swing State Project (www.swingstateproject.com)⁸ – an online publication devoted to political analysis. The issues in using the raw district level data are as follows. First, density of the congressional districts is proportional to the population density. Second, large airports are usually located in the metropolitan areas with multiple districts. This means that investment into the metropolitan area airports may spill over beyond the congressional districts in which those airports are located. We have therefore identified the congressional districts adjacent to every district in our dataset; and will in some specifications average the election results across the given and all the adjacent districts.

Accounting for the impact of the Senate is a tricky thing to do, as Senators are elected for six-year terms, and only a third of the Senate is up for reelection every other year. We have therefore recorded, for each State, results of the latest Senate election. All the States were thus covered by 2008 and 2006 elections results. To account for any potential impact of the Senate composition on the grant allocation, we created indicator variables for States where both Senators represented either the Democratic or the Republican Party. Additionally, we will later present results of analysis of data, aggregated at the State level, to better account for the fact that Senate members' constituencies are the US States. Descriptive statistics for some of the political and control variables are presented in Table 3 below.

⁸ These data can be obtained from other sources – for instance, CNN web-site. However, Swing State Project presented this information in easily accessible form.

Table 3 Descriptive Statistics for Political and Control Variables

	Mean	Standard deviation	Minimum	Maximum
Percentage difference between democratic and republican votes in House election	13.74	14.27	-100.0	100.0
Percentage difference between democratic and republican votes in 2008 Presidential election	8.78	29.56	-54.00	90.00
Percentage difference between democratic and republican votes in Senate election	5.23	29.27	-87.53	79.53
Congressional district per capita income	\$43,598	\$11,281	\$19,311	\$92,181
County population	142,593	420,300	117	9,862,049
State population	6,019,636	6,780,646	544,270	36,961,664

4. Data analysis

4.1 Hypotheses and methodology

The literature suggests three possible sources of political influence: the White House (President), the US Senate, and the Congressional Committees. We hypothesize that the impact of the White House should be the strongest in this particular case. As for the hypotheses related to the impact of the White House, we can suppose that ARRA grants might have been used to reward districts which showed support to Obama, as evidenced by the election results. Thus, our first contention is:

- *Larger Obama-McCain vote differential in the 2008 Presidential election will be associated with higher level of funds appropriated to airports located in a corresponding district.*

An alternative explanation – grants could be used to sway voters in the districts where support for Obama was not sufficiently strong – is less plausible, as the grants have been appropriated *after* the election.

A priori, we can expect results of the US House of Representatives election to have less of an effect on grant appropriations. At the same time, we can also suppose that the ARRA grants are more likely to be used as an instrument to sway the voters in this case (see also Levitt and Snyder, 1997). Therefore, in addition to the percentage difference in votes, we will use dummy variable for districts in which the Democratic candidate lost the House election. The second hypothesis is thus the following:

- *Larger Democratic-Republican candidate vote differential in the House election will be associated with higher level of funds appropriated to airports located in a corresponding district.*

To evaluate the extent of the committee power, we have identified congressional districts represented by the members of the US House of Representatives Committee on Transportation and Infrastructure, and created the corresponding indicator variable. The corresponding hypothesis is:

- *Membership in the House Transportation and Infrastructure Committee will be associated with higher level of funds appropriated to airports located in a corresponding district.*

To account for the possible impact of the US Senate, we will include percentage difference in votes received by the Democratic and the Republican Party contenders at the last Senate election held in a given State. Senate composition variables (dummies for States with both Senators represented by either political Party) are also used in some specifications. The corresponding hypotheses are:

- *Larger Democratic-Republican candidate vote differential in the latest Senate election will be associated with higher level of funds appropriated to airports located in a corresponding state.*
- *Presence of a Senator from the Democratic Party will be associated with higher level of funds appropriated to airports located in a corresponding state.*

We will analyze the data in the following ways. First, since many airports in our dataset did not receive the ARRA grants; censored normal regression (also known as Tobit) estimation is appropriate. Airports that did not receive any grants either did not apply or had their applications turned down. We can thus make an argument for existence of a latent variable behind the ARRA grant amount data.

Total amount of ARRA grant(s) received by the airport (in millions of dollars) will be the dependent variable; and Huber-White standard errors will be reported. To assess effect of political variables on the likelihood of an airport receiving an ARRA grant, we will estimate the probit model, with the corresponding indicator as the dependent variable. Next, we will perform analysis of the project-level data to evaluate whether any political effects we might have captured could be explained by the project-

specific heterogeneity. Finally, we will aggregate the data to the state level to evaluate the impact of the political factors at the amount of ARRA funds received by all the airports located in a given state. State rather than congressional district represent the relevant constituency for the Senators. We will use state-level population, total operations in all airports located in a state, as well as total operations in all airports receiving ARRA funds as control variables in the state level regressions. Note that state level regressions only include results from the Presidential elections. In fact, including Senate and House election results weakens the fit to the data (in terms of adjusted R-squared) without impacting other variables significantly.

Before we continue, it pays to discuss the expected signs of the coefficients on the control variables. Despite the FAA's stated emphasis on smaller airports; both intuition and descriptive statistics suggest that variables measuring the airport size will likely have positive effect on the amount of the grant received, as otherwise equal projects will be costlier to implement in larger airports. We do not, however, have a prior expectation for the effect of the number of operations per runway. On one hand, this is yet another indicator of airport size, suggesting a positive sign. On the other hand, busier airports may also have more funds available to them via other sources (AIP grants and PFC funds). Expected impact of the total AIP grants volume is also ambiguous: larger airports receive more AIP grants, but previous AIP funding may indicate less need for infrastructure investment under the ARRA program. State population is expected to have a negative sign in airport-level regressions, due to disproportionate impact of less populous states in US politics. The state-level regressions include, as a measure of extent of aviation-related infrastructure, total operations at all the airports within the state. This variable is expected to have positive effect on the total amount of ARRA grants received by the airports within a state.

4.2 Results and discussion

The following five tables present results of our data analysis. Table 4 reports the Tobit model results for several specifications. The differences across specifications we employ are in the variables related to the House of Representatives – we do this as a conventional sensitivity check of our results. Results for the probit model are in Table 5. Table 6

includes results for the specifications taking into account election results in the adjacent districts. Table 7 reports results of the project-level data analysis. Results for the state level data analysis are reported in Table 8.

[Insert Tables 4 through 8 here]

Based on those tables, we can make the following general conclusions about the supposed impact of political factors on allocation of ARRA airport infrastructure grants. First, results of the presidential election appear to affect the amounts of grants, but do not have an impact on whether the airport receives the grant. Second, controlling for the State level composition of the Senate, we detect seemingly counter-intuitive evidence for impact of the Senate on the grant allocation process. Namely, airports located in the states carried by a Republican at the latest Senate election show higher likelihood of obtaining the grant; the amounts involved are also higher. At the same time, airports located in the states represented by two Democratic Party senators are also more likely to obtain the grants, other things equal – an expected result. State level regression results demonstrate that, controlling for the size of the state’s airport infrastructure, states represented by two Republican senators received the least ARRA money. Interestingly, it appears that most funds go to the states represented by one Democratic and one Republican senator. Third, airport-level and project-level regressions do not produce strong evidence of impact of the House of Representatives election results or membership in Transportation and Infrastructure Committee. At the same time, House representative from a state sitting on the Transportation and Infrastructure Committee does positively impact the total amount of ARRA funds going to that state. Let us examine these statements in more detail.

Conclusion about impact of the White House on the grant allocation process stems primarily from the Tobit regression results. These show positive association between the district level Presidential election results and the amount of funds allocated to the airport. We have suggested that such association is consistent with rewarding districts for their contribution to the election outcome. Note we have checked for the existence of separate effects for the districts in which Obama won, or districts with small Obama-McCain vote differential, and did not find any. The association between the airport infrastructure grants and the Presidential election results does break down once we factor in adjacent districts, or look at the state level data; however, such a result does not

necessarily weaken our conclusion, but demonstrates rewards have been targeted to the specific districts.

Impact of the Presidential election results shows more robustly in Tobit than in probit regressions. Our results indicate that Presidential election had impact on the amount of grants received by the airport rather than the likelihood of an airport receiving the money. Specifically, the Tobit model suggests that, conditional on the airport receiving an ARRA grant, a 10 unit increase in the Obama-McCain vote percentage difference would lead to \$270,000 – 370,000 increase in the amount of ARRA grant received by the airport (note that, conditional on the dependent variable being positive, Tobit measures a linear relationship).

The relationships between the presidential election vote differentials and the ARRA airport grants appropriations, reported in Tables 4 and 5 do break down once we account for the adjacent districts. At the same time, we cannot necessarily state that there is no relationship because it did not survive this check. We have here looked at adjacent districts for the entire country (i.e., both urban and rural areas). While we generally can expect adjacent districts to matter more in urban areas; focusing only on urban area airports would require constructing the relevant sub-sample in a somewhat arbitrary way. Note also that in the project level regressions the result is quite the opposite – accounting for adjacent districts, we gain statistical significance for the Obama-McCain vote differential variable.

As for the variables measuring role of Senate in the appropriations process, we detect the following. First, impact of Senate election results only shows where we also control for the State level composition of the Senate. Second, we observe association of the Senate election results with both the likelihood of the airport receiving a grant, and the amount of the money involved. Third, unlike with the presidential election results; both likelihood of receiving a grant and the amount involved are larger the higher the share of votes received by the Republican Party candidate relative to his/her Democratic Party opponent in the latest Senate race. Note that this effect (see Table 4) is about half the size of the impact of presidential election results. A result that is more expected is that, other things equal, an airport located in a state represented by two Democratic Party Senators is more likely to receive an ARRA grant. Further, state level results clearly

show that states represented by at least one Democratic senator received more ARRA funds as compared to those represented by two Republican senators, other things equal.

Our data analysis failed to detect any impact of the House of Representatives election results on allocation of funds in question. At the same time, there is rather robust evidence of the House Transportation and Infrastructure Committee impact on how much money goes to the States. Table 8 shows that states with at least one representative sitting on the said Committee received at least 20 percent more funds, other things equal.

Overall, our results can be considered consistent with the political factors having played a role in ARRA airport grant appropriations. It also appears that the White House and the Senate have been more important players in the process than the House of Representatives. At the same time, our results do not suggest that the House did not have a role in distribution of hundreds of billions of federal grants under ARRA. Recall that our study deals with only \$1.1 billion of funds in what is a \$787 billion economic stimulus package.

Looking at our results for the control variables, we can say the following. First, airport's total operations, runway length, and number of operations per runway affect both the likelihood and the size of the grant in the expected fashion. Larger airports are more likely to receive grants, and they receive larger grants. However, busier airports, other things equal, receive less money and are less likely to receive it. As we indicated, the latter relationship could be driven by the fact that busier airports have other sources of funding available to them. Airports that received more AIP grants over the preceding five years are also more likely to receive larger ARRA grants. This result was not exactly as expected, and we do not have a very good explanation for it now (except maybe for the suggestion that this variable could work as another proxy for the airport size). Next, state population has an expected effect on both the likelihood and the size of grants, reflecting on the disproportionate impact of smaller states in the US political system. While per capita income does not have a significant effect on either the grant size or the likelihood of an airport receiving the grant; negative signs of most of the coefficients are actually intuitive. Higher per capita income means higher demand for air travel, potentially translating into both higher Passenger Facilities Charges and higher likelihood of

attracting financing on the capital market through bonds. That is, airports in more prosperous areas, other things equal, have less of a need for AIP grants.

5. Conclusions

This study offers the first look at the issue of the impact of political factors on the distribution of federal funds for the transportation related infrastructure investment in the USA. We take advantage of the American Recovery and Reinvestment Act (ARRA) of 2009 (more broadly known as the Stimulus) to examine whether political factors played any role in allocation of the \$1.1 billion worth of Airport Improvement Program (AIP) grants included into the package. The Stimulus provides an excellent case for studying the political economy of airport investment, at least as far as the Federal involvement is concerned. The law was set up rather hastily – Barack Obama was elected President in November of 2008, and ARRA became law on February 17, 2009; and the criteria for the airport infrastructure projects to be funded under AIP as part of ARRA were rather vague. We can therefore suspect that the airport infrastructure grants could be used by the Administration or the Congress as a mechanism to reward districts which brought more votes in the latest election. The data structure allows easy matching of the airport characteristics, ARRA grant details, and election outcomes at the congressional district level.

Moreover, study of aviation related infrastructure offers an attractive environment for examining the more general issue of political factors behind the allocation of federal funds. Airports and airfields are ubiquitous, unlike, for instance, tornadoes or corn fields. Also, airports are generally viewed favorably by the public, unlike some other kinds of federally provided infrastructure (e.g., prisons).

For this study, we make use of information on the airport infrastructure grants, appropriated under the ARRA of 2009. We supplement this data with airport characteristics, simple demographic measures, congressional district level results of November 2008 election (both Presidential and House), and Senate election results.

Data analysis suggests the following general conclusions about the supposed impact of political factors on allocation of ARRA airport infrastructure grants. First, results of the presidential election appear to affect the amounts of grants, but do not have

an impact on whether the airport receives the grant. Second, controlling for the State level composition of the Senate, we find that airports located in the States carried by a Republican at the latest Senate election show higher likelihood of obtaining the grant; the amounts involved are also higher. At the same time, airports located in States represented by at least one Democratic Party senator are also more likely to obtain the grants, other things equal. Third, states with House representatives sitting in the Transportation and Infrastructure Committee received substantially more ARRA funds, controlling for the size of the aviation related infrastructure.

Throughout the world, regulators have been reconsidering the role of the airports. Also, our understanding of the determinants of public infrastructure investment, and especially of the role of political factors, is far from complete. This study is one of the first attempts at looking into both issues together. We find that political factors matter. The next issue to be addressed – and the one which will require a more thorough investigation of these political factors – is what our results imply for such important public policy issues as airport regulation, privatization, and congestion.

Our study does have several important limitations. Most importantly, we only observe successful grants. We do not observe airports which applied for AIP grants under ARRA, but did not receive them. Thus, we cannot distinguish between unsuccessful bidders and airports that decided not to apply. This is unfortunate, as our analysis would be more insightful were we able to account for these potential sample selection biases. Second, as airports in the USA are mostly run as public enterprises owned and operated by local authorities; politics at the local level could play a role. Identifying the exact level of local politics that plays a role would be very difficult, however, as some airports are run by cities, others – by counties, and some – by airport authorities set up by multiple jurisdictions (such as the New York New Jersey Port Authority). Last but not least, our analysis is effectively based on the assumption that this appropriation was a stand-alone event, detached from the complex repeated game of Washington politics. While the extraordinary nature of the ARRA and the Great Recession provides a defense of this point of view; we have to acknowledge that this study heavily hinges on it.

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Table 4 Airport level Tobit results

	Specification 1	Specification 2	Specification 3	Specification 4
Constant	-58.098** (18.545)	-55.641** (18.412)	-53.925** (18.666)	-51.873** (18.520)
Logarithm of airport's area	0.2641 (0.4284)	0.2708 (0.4262)	0.2347 (0.4324)	0.2434 (0.4304)
Logarithm of total operations	3.0555** (0.9025)	3.0011** (0.8997)	3.1249** (0.9102)	3.0745** (0.9073)
Logarithm of average runway length	3.7463** (1.3991)	3.7099** (1.3990)	3.8613** (1.4045)	3.8239** (1.4031)
Logarithm of operations per runway	-2.6830** (0.8413)	-2.6109** (0.8355)	-2.7347** (0.8474)	-2.6673** (0.8417)
Percentage difference between democratic and republican votes in House election	0.2735 (0.6977)	---	0.1861 (0.7029)	---
Dummy for districts lost by Democratic party in House election	---	0.2976 (0.5880)	---	0.3524 (0.5959)
District House representative is a member of Transportation and Infrastructure Committee	-0.2906 (0.6374)	-0.2591 (0.6432)	-0.3702 (0.6395)	-0.3328 (0.6452)
Percentage difference between democratic and republican votes in 2008 Presidential election	0.0304** (0.0139)	0.0372** (0.0144)	0.0271** (0.0147)	0.0337** (0.0153)
Percentage difference between democratic and republican votes in Senate election	-0.0083 (0.0080)	-0.0084 (0.0080)	-0.0181* (0.0100)	-0.0182* (0.0100)
Both state senators are democrats	---	---	1.0960 (0.7356)	1.1448 (0.7325)
Both state senators are republicans	---	---	0.0649 (0.7827)	0.1320 (0.7815)
Logarithm of total AIP grants over 2005-2009	0.9901** (0.4382)	0.9852** (0.4383)	0.9685** (0.4346)	0.9622** (0.4346)
Logarithm of congressional district per capita income	0.2426 (1.4155)	0.0410 (1.4094)	-0.2421 (1.4403)	-0.4137 (1.4340)
Logarithm of county population	0.3675 (0.2688)	0.3631 (0.2679)	0.4206 (0.2719)	0.4137 (0.2706)
Logarithm of state population	-0.6366** (0.2978)	-0.6488** (0.2970)	-0.6899** (0.3063)	-0.6979** (0.3053)

Notes:

1. Dependent variable is total amount of ARRA grant(s) received by an airport (in millions of dollars).
2. Huber – White standard errors in parentheses.
3. Specifications that do not include logarithm of State population include State dummy variables.
4. Number of observations – 1937.
5. Significance: * - 10%; ** - 5%.

Table 5 Airport level probit results

	Specification 1	Specification 2	Specification 3	Specification 4
Constant	-7.2085** (3.1403)	-6.9593** (3.1309)	-6.3257** (3.1953)	-6.1365** (3.1850)
Logarithm of airport's area	0.0537 (0.0699)	0.0543 (0.0699)	0.0480 (0.0708)	0.0486 (0.0708)
Logarithm of total operations	0.3852** (0.1402)	0.3805** (0.1402)	0.3989** (0.1418)	0.3949** (0.1419)
Logarithm of average runway length	0.4675** (0.2332)	0.4642** (0.2335)	0.4909** (0.2332)	0.4883** (0.2335)
Logarithm of operations per runway	-0.2681** (0.1317)	-0.2618** (0.1317)	-0.2780** (0.1328)	-0.2727** (0.1328)
Percentage difference between democratic and republican votes in House election	0.0411 (0.1216)	---	0.0233 (0.1220)	---
Dummy for districts lost by Democratic party in House election	---	0.0124 (0.1005)	---	0.0232 (0.1021)
District House representative is a member of Transportation and Infrastructure Committee	-0.0528 (0.1060)	-0.0517 (0.1071)	-0.0692 (0.1066)	-0.0668 (0.1077)
Percentage difference between democratic and republican votes in 2008 Presidential election	0.0038* (0.0022)	0.0044** (0.0022)	0.0031 (0.0024)	0.0037 (0.0025)
Percentage difference between democratic and republican votes in Senate election	-0.0020 (0.0014)	-0.0020 (0.0014)	-0.0039** (0.0017)	-0.0039** (0.0017)
Both state senators are democrats	---	---	0.2138* (0.1207)	0.2185* (0.1204)
Both state senators are republicans	---	---	0.0045 (0.1289)	0.0100 (0.1291)
Logarithm of total AIP grants over 2005-2009	0.1591** (0.0741)	0.1587** (0.0740)	0.1548** (0.0733)	0.1543** (0.0732)
Logarithm of congressional district per capita income	-0.0767 (0.2427)	-0.0967 (0.2436)	-0.1771 (0.2495)	-0.1931 (0.2503)
Logarithm of county population	0.0343 (0.0432)	0.0340 (0.0431)	0.0448 (0.0433)	0.0444 (0.0433)
Logarithm of state population	-0.1047** (0.0495)	-0.1060** (0.0492)	-0.1162** (0.0499)	-0.1170** (0.0496)
McFadden R-squared	0.2005	0.2005	0.2029	0.2029

Notes:

1. Dependent variable is the indicator variable for whether an airport received ARRA grant(s).
2. Huber – White standard errors in parentheses.
3. Number of observations – 1937.
4. Significance: * - 10%; ** - 5%.

Table 6 Airport level results, accounting for adjacent districts

	Probit		Tobit	
	Specification 1	Specification 2	Specification 3	Specification 4
Constant	-6.5124** (3.3404)	-6.0860* (3.3635)	-45.635** (19.638)	-43.877** (19.714)
Logarithm of airport's area	0.0407 (0.0708)	0.0332 (0.0721)	0.1781 (0.4353)	0.1436 (0.4410)
Logarithm of total operations	0.4086** (0.1405)	0.4229** (0.1428)	3.2343** (0.9086)	3.3038** (0.9185)
Logarithm of average runway length	0.4768** (0.2354)	0.5019** (0.2362)	3.9252** (1.4158)	4.0401** (1.4239)
Logarithm of operations per runway	-0.2905** (0.1328)	-0.2999** (0.1343)	-2.8449** (0.8470)	-2.8951** (0.8551)
Percentage difference between democratic and republican votes in House election	-3.60E-05 (0.0027)	8.41E-05 (0.0028)	0.0031 (0.0159)	0.0034 (0.0165)
District House representative is a member of Transportation and Infrastructure Committee	-0.0617 (0.1063)	-0.0717 (0.1069)	-0.4306 (0.6411)	-0.4788 (0.6442)
Percentage difference between democratic and republican votes in Presidential election	0.0026 (0.0041)	-1.23E-05 (0.0045)	0.0383 (0.0256)	0.0275 (0.0276)
Percentage difference between democratic and republican votes in Senate election	-0.0016 (0.0015)	-0.0041** (0.0018)	-0.0082 (0.0083)	-0.0195** (0.0102)
Both state senators are democrats	---	0.2451** (0.1215)	---	1.1528 (0.7331)
Both state senators are republicans	---	-0.0484 (0.1281)	---	-0.1315 (0.7836)
Logarithm of total AIP grants over 2005-2009	0.1625** (0.0748)	0.1576** (0.0737)	1.0038** (0.4426)	0.9812** (0.4385)
Logarithm of congressional district per capita income	-0.1556 (0.2646)	-0.2184 (0.2660)	-1.0152 (1.5532)	-1.2894 (1.5575)
Logarithm of county population	0.0495 (0.0432)	0.0648 (0.0432)	0.4246 (0.2684)	0.4928* (0.2716)
Logarithm of state population	-0.1118** (0.0510)	-0.1235** (0.0510)	-0.7176** (0.3095)	-0.7671** (0.3139)
McFadden R-squared	0.1973	0.2009	---	---

Notes:

1. Dependent variable is total amount of ARRA grant(s) received by an airport (in millions of dollars) in Tobit; dummy variable for whether an airport received ARRA grant(s) in probit.
2. Measures of percentage differences of election results are un-weighted averages for the current and all immediately adjacent districts.
3. Huber – White standard errors in parentheses.
4. Number of observations – 1937.
5. Significance: * - 10%; ** - 5%.

Table 7 Project level regression results

	Current district		With adjacent districts	
	Specification 1	Specification 2	Specification 3	Specification 4
Constant	3.4274 (3.6387)	4.1714 (3.6848)	8.6580** (3.8515)	9.2734** (4.0339)
Logarithm of airport's area	-0.0721 (0.1031)	-0.0736 (0.0976)	-0.0726 (0.0960)	-0.0618 (0.0906)
Logarithm of total operations	0.3223* (0.1869)	0.3174* (0.1785)	0.3090* (0.1820)	0.2846* (0.1701)
Logarithm of average runway length	0.8789** (0.3317)	0.8368** (0.3281)	0.8943** (0.3122)	0.8172** (0.3102)
Logarithm of operations per runway	-0.3022 (0.1898)	-0.2755 (0.1834)	-0.2972* (0.1843)	-0.2417 (0.1739)
Percentage difference between democratic and republican votes in House election	-0.0002 (0.0019)	-0.0003 (0.0019)	-0.0053 (0.0047)	-0.0012 (0.0016)
District House representative is a member of Transportation and Infrastructure Committee	0.0050 (0.1511)	-0.0527 (0.1462)	-0.0137 (0.1465)	-0.0698 (0.1406)
Percentage difference between democratic and republican votes in Presidential election	0.0046 (0.0035)	0.0029 (0.0033)	0.0186** (0.0071)	0.0132** (0.0049)
Percentage difference between democratic and republican votes in Senate election	-0.0003 (0.0027)	-0.0001 (0.0023)	-2.27E-05 (0.0027)	-0.0003 (0.0023)
Both state senators are democrats	0.0169 (0.1901)	-0.0297 (0.1848)	-0.0079 (0.1929)	-0.0768 (0.1882)
Both state senators are republicans	0.0412 (0.1847)	0.0065 (0.1729)	0.1595 (0.1807)	0.0816 (0.1638)
Logarithm of total AIP grants over 2005-2009	0.0734 (0.0722)	0.1115 (0.0715)	0.0805 (0.0685)	0.1157* (0.0695)
Logarithm of congressional district per capita income	0.2323 (0.3039)	0.1505 (0.3074)	-0.2053 (0.2897)	-0.2617 (0.3185)
Logarithm of county population	0.0878 (0.0620)	0.1094* (0.0589)	0.0742 (0.0622)	0.0865 (0.0591)
Logarithm of state population	-0.0172 (0.0716)	-0.0431 (0.0684)	-0.0473 (0.0730)	-0.0665 (0.0678)
Runway grants	---	0.6524** (0.1354)	---	0.6491** (0.1336)
Taxiway grants	---	0.1954 (0.1716)	---	0.2433 (0.1678)
Airport terminal grants	---	0.4794 (0.4518)	---	0.4801 (0.4700)
Apron grants	---	0.5576** (0.1918)	---	0.5663** (0.1852)
Adjusted R-squared	0.2255	0.2907	0.2514	0.3037

Notes:

1. Dependent variable is logarithm of total amount of ARRA grant.
2. White heteroscedasticity consistent standard errors in parentheses.
3. Number of observations – 243.
4. Significance: * - 10%; ** - 5%.

Table 8 State level regression results

Regressor	Specification 1	Specification 2	Specification 3
Constant	7.2196** (1.4748)	8.3124** (1.1317)	7.6417** (1.2749)
Logarithm of total airport operations, state level	0.4561** (0.1604)	---	0.1677 (0.1302)
Logarithm of total operations in ARRA airports, state level	---	0.5807** (0.1173)	0.5097** (0.1215)
Logarithm of state population	0.2022 (0.1301)	0.0700 (0.1034)	0.0185 (0.1129)
At least one House representative is a member of Transportation and Infrastructure Committee	0.3456** (0.1447)	0.2321** (0.1073)	0.2145* (0.1064)
Both Senators are from Democratic Party	-0.3438* (0.1884)	-0.3933** (0.1504)	-0.3885** (0.1548)
Both Senators are from Republican Party	-0.5987** (0.2262)	-0.4976** (0.1588)	-0.4966** (0.1600)
Obama-McCain vote differential	-0.0062 (0.0052)	-0.0081* (0.0041)	-0.0062 (0.0040)
Adjusted R-squared	0.6100	0.7202	0.7235

Notes:

1. Dependent variable is natural logarithm of State level total ARRA airport grants
2. Airport operations and state population are in logarithmic form.
3. Number of observations – 50.
4. Significance: * - 10%; ** - 5%.