

The Hudson River Rail Tunnell Link Study

Final Report
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16. Abstract In 2012 Superstorm Sandy flooded critical passenger rail tunnels carrying major commuter lines under the Hudson River between New York City and New Jersey; these tunnels are essential to the Northeast Corridor, as they link Washington and Boston with Philadelphia and New York City in between. Managers and elected officials have determined that the tunnels will need to be repaired and replaced, and they have a political agreement on this effort, dubbed The Tunnel Project, which is part of The Gateway Program. In this era when bond issues and tax increases are under increased scrutiny, we thought it important to learn what New Jersey statewide public opinion is about new tunnels and willingness to financially support the projects to develop them. We used dual-frame random digit dialing to ask 889 New Jersey residents their attitudes and opinions on the rail tunnels and other related critical infrastructure concerns. While many supported new tunnels, and some supported a bond and/or a user fee, these projects were rated less important than every other issue. A small group of 8 % supported both funding mechanisms, and a group about three times as large opposes both funding mechanisms. The attitude-of-support clustered in five categories, confirmed by multinomial regression. We encourage proactive efforts on the part of key stakeholders to enhance the public's and key organization's awareness of the critical significance of this infrastructure, and the risk of failing to properly fund remediation so that this critical transportation link remains viable.			
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DESCRIPTION OF THE PROBLEM

The need for passenger rail tunnels under the Hudson River between New Jersey and New York City begins in the 19th century when business and political leaders recognized that rapidly growing New York City had to be linked to New Jersey, its western neighbor, with tunnels and/or bridges.¹ By the year 1890, ferries were bringing 80 million passengers a year across the mile wide Hudson River, and by 1900, the number was 90 million passengers, or about 250,000 a day. Jones's¹ *Conquering Gotham* tells the story of building the tunnels, documenting political, economic, and health problems associated with the ferry traffic, including ferry collisions, ships capsized by bad weather, and other hazardous transportation problems that caused deaths and injuries. Safely using ferries remains a challenge for maritime risk analysts across the globe.^{2,3}

In 1910, after three decades of debates, failed starts, property acquisition disputes, bribery charges and a litany of other issues, the 6,000-foot (1.83 km) long train tunnels were completed. The human health and safety costs were workers killed and injured by falls, fires, equipment failures, engulfed in quicksand, and at least one major dynamite explosion. Some who worked 100 feet below the surface died from the bends because they could not adjust to the change in atmospheric pressure while resurfacing. The long-term risk of having built the tubes in the silt beneath the river and not anchoring them into the bedrock below was set aside.

The two train tunnel tubes became reliable parts of the infrastructure until 2012 when so-called Superstorm Sandy struck the region killing over 100 people and causing over \$50 billion damage.^{4,5} Beneath the Hudson River, part of the Sandy legacy was that salt water had seeped into the train tunnels. When they were pumped out, chloride and sulfate residuals that remained damaged the rails, concrete structures, and electronics. An engineering study of the damage, while much more reassuring than frightening, notes that there are already examples of walls falling on the tracks requiring immediate repair and that these incidents will increase. The report asserts that the tunnels remain safe at this time. The assessment asserts that the most severe damage was to points of entrance and egress, as well as to electronic components. The total cost of repairing the tunnels was estimated at \$689 million, which includes the tunnels linking New Jersey and New York City and the tunnels linking parts of Manhattan with Long Island, NY. Notably, the analysts also reported that they were not able to inspect all the engineered systems, which is a reason for additional human health and safety concern and a sizeable contingency fund.⁶

In 2015, Amtrak, the federally-chartered corporation responsible for the tunnels, reported that each tunnel would need to be closed for repairs for at least a year.^{7,8} These findings must have sent a shiver down the spine of many people who had assumed that the tunnels would be there in perpetuity, albeit with proper maintenance. If action was not taken to build new tunnels, the managers indicated that the tunnels eventually would be closed, returning the region back to late 19th century when hundreds of ferries carried people across the river, and adding to the already difficult challenges of moving people in cars and buses over crowded bridges and through tunnels. A return to the past would not only cause an economic slowdown, potentially leading to loss of jobs in the region, and would increase human health and safety risks associated with increased driving and air pollution emissions.

Turning back the clock is not acceptable to daily commuters and to millions travelling between Washington DC and Boston MA along the northeast corridor rail line. In 2015, Amtrak

reported 16 stations had boarding and deboardings of 600,000+ passengers. Nine of the 16 were on the corridor between Washington, DC and Boston. At the top of the list with 10.1, 4.9 and 4.1 million were, New York, Washington, DC and Philadelphia, respectively.⁷

The inevitable, if not surely logical, conclusion is that new tunnels will be built to avoid the human health and safety problems and maintain the regional economy. Building new tunnels is the preferable remediation in that it allows the old tunnels to be closed one at a time and repaired. Ultimately, when the old repaired, and newly-built tunnels are reopened, the added capacity will constitute a mutually beneficial outcome, surely a win-win for human health risk reduction and regional—indeed—national economic enhancement.

It is not, however, all that simple. One key concern involves national level disagreements among those who hold the budget purse strings; to be sure, it is not clear to these authors that the federal government would spend \$20 billion (an initial estimate) to build these tunnels.^{7,8} On the surface, our concern seems unwarranted. First, President Obama has indicated that this Hudson River link is the number one infrastructure priority in the United States; second, New Jersey and New York Senators have worked to build a coalition in support of the project; and third, the Democrat governor of New York and the Republican Governor of New Jersey have all voiced support for it.^{8,9} Indeed, Amtrak presents a ready summary of the broader funding issue on a website entitled “Northeast Corridor Projects, The Gateway Program,” where they candidly state they don’t know how much it is going to cost:¹⁰

The Gateway Program is still in the planning and design phase and a reliable program cost estimate has not yet been developed. Amtrak has directed more than \$300 million, mostly from federal sources, to the Gateway Program since 2012. This includes approximately \$74 million for planning and pre-construction work and \$235 million to the Hudson Yards concrete casing from federal Sandy Resiliency funding under the Disaster Relief Appropriations Act of 2013.

The Gateway Program includes our focus, the Hudson Tunnel Project, as well as the Portal Bridge Replacement Project, and the Hudson Yards Right-of-Way Preservation Project. On the webpage within the Gateway Program website dedicated to the tunnel project, Amtrak details that only preliminary planning work has been funded and is underway:¹¹

Full funding for the environmental planning work and preliminary engineering of the Hudson Tunnel Project has been provided by Amtrak, the Port Authority, and NJ TRANSIT totalling [sic] \$86.5 million.

In addition to Amtrak’s public engagement website, NJ Transit has its own Hudson Tunnel Project dedicated to public engagement with regard to the Environmental Impact Statement [EIS], which it is jointly preparing with the Federal Railroad Administration.¹² At that site the public can view the Scoping Document for the EIS, along with a “Library” of project-relevant documents.

Under the Frequently Asked Questions [FAQ] page for this site, there are two references to funding, the FAQs, “How much will the Hudson Tunnel Project cost?” and “Where will the funding come from?”¹³ To the former, the answer given aligns with Amtrak’s, basic message of “we don’t know.” Here, when asked about the cost, the prepared FAQ response is “Project costs are still being developed.” To the latter, probing sources of funding, the answer is “The funding

sources for the Hudson Tunnel Project are still being determined and will include a combination of federal, state, local, and possibly private funding.”

We are deeply concerned about the funding and implementation of this critical infrastructure project. We are concerned that it is, by no means, a certainty in regard to financial support. Would a fiscally conservative President elected in 2016 with a conservative Congress prioritize the Gateway Program? Would it consider the tunnel project a federal concern?

The national level notwithstanding, there is an assumption that the state would need to pay a share of this, generally thought to be in the \$3-5 billion range. To understand that, it is essential to probe public support for various funding mechanisms. Would the state-wide public support borrowing money from the federal government, and repaying the loan through a bond issue? Would the public support a tunnel user's fee? A dedicated tax increase? We consider these questions vital to fully understanding the public's willingness to support the tunnel project.

APPROACH

This paper, then, asks whether there is sufficient public support for funding the tunnel project, and provide a methodology for drawing inferences from recently collected survey data designed to explore three questions:

1. Importance, absolute and relative: How important does the New Jersey public consider the building of new rail tunnels between New Jersey and New York City to be opened within a fifteen-year timeline? How does the importance of the tunnels compare to other policy issues, such as education and health care, which will also require financial support?
2. Willingness-to-Pay: What proportion of respondents is willing to support New Jersey's share of the cost of this project through issuance of state bonds and/or a user's fee? Does the public cluster in categories with regard to attitude toward funding infrastructure projects?
3. Approaches to Funding: How does the public perceive the attributes and drawbacks of those various funding mechanisms?

Several elements of the black and gray literatures guided the study design. First, in regard to funding, there is room for optimism. A bond is money borrowed from an entity for a specific period of time and at a fixed interest rate. Ballotpedia¹⁴ follows bond issue votes across the United States. Since 2000 in 29 U.S. states, 70% of statewide bond proposals have been approved by voters. In New Jersey, all four the bonds issues between 2000 and 2010 were approved by the voters. In most cases, bonds are easily approved with over 60% in support in New Jersey. In 2008, for example, The Trust for Public Land¹⁵ found that 61% of New Jersey voters favored a statewide general obligation bond for conservation programs. Bonds, in fact, have historically done well in New Jersey. For example, in the early 1980s the state of New Jersey passed a bond that provided \$100 million toward state efforts to clean up hazardous waste sites.¹⁶ That is a small amount by 21st century standards, but it was the first such bond in the United States and made a convincing statement that the population was willing to approve expenditures that they recognized as valuable. Furthermore, polls shows public support for trains has been high for at least the last two decades in the United States.^{17,18}

But there are reasons to believe that the honeymoon with bonds and rail is coming to close, even in New Jersey. First, states and local governments have become increasingly dependent on bonds. Voters are scrutinizing them even if they support the reason for requesting funds (*Ballotpedia*).¹⁴ In New Jersey, Fallon reported on an open space ballot in 2014 that barely passed.¹⁹ The reason why that “near-miss” is important is that in 2014, the Green Acres open space program was 53 years old; it is a perennially-successful mother-and-apple-pie issue that buys open space, upgrades parks, rehabilitates historical sites, preserves farmland, and buys flood prone lands in cities, suburbs and rural areas. Fallon notes that a conservative anti-tax group entered the arena spending to try to get the measure defeated, and it only barely passed, a distressing observation for those that want to continue to rely on bonds.

If the public is scrutinizing open space funding, they certainly may be skeptical about rail tunnels. Indeed, there is good reason for them to be skeptical. The idea for building new tunnels is not new. In June 2009, McGeehan reported that New Jersey officials “have been planning the next train tunnel under the Hudson River for so long that it is already on its third name.”²⁰ The Access to the Region’s Core (ARC) tunnel, the reporter notes, had been conceived in 1994 and was going to cost \$8.7 billion (later revised to \$14 billion).

A little over a year later, the same *New York Times* journalist²¹ reported that Governor Christie halted the project arguing that New Jersey’s portion of the cost was too high. The State forfeited \$3 billion of federal money and additional funds from the regional Port Authority of New York and New Jersey. Michael Bloomberg, the Mayor of New York City, at the time, said the “New York City did not have the money to help New Jersey pay for the overruns.”²² Nobel Prize economist Paul Krugman criticized the decision, characterizing it as the sacrificing of our future for short-term political gain. Other elected officials and the federal government stepped in and tried to save the idea, and when nature, in the form of Superstorm Sandy intervened, the Gateway project resurfaced.²²

Contemporary news reports showed that the New Jersey Governor was also not happy with the location of where the tunnel would emerge in New York. Even though he supports the new plan, we suspect that there will be some mental scar tissue in the mind of the New Jersey public about the tunnels in New Jersey that might dissuade some people from voting in support of a bond issue, especially since some of the same designs will be used as were proposed for the ARC tunnel. Arguably, the Gateway tunnel’s timeline could be pushed back, much as the previous proposals were delayed and abandoned. With this record of failure and mixed messages, some will argue that if the tunnels are important to not only New Jersey and New York, but also to the entire Northeast Corridor, then the cost should be entirely paid by the federal government. Another way of saying this is that if the tunnels were so important as a national asset, the United States government would not allow local politics to figuratively derail the project.

The Hudson River tunnels are not a singular case of public opposition to major rail management projects. Vartabedian reports that the \$68 billion high-speed rail line between Los Angeles and San Francisco is now opposed by a majority of California residents.²³ A bond to fund this rail project passed in 2008, but polls indicate that the majority of voters now want it stopped. The major issues are cost and public’s perception that they would rarely use it. In the United Kingdom, Dahlgreen reports mounting opposition to a high-speed rail line between London and Birmingham.²⁴ Again, as the cost estimates increased, public opposition has increased. Given the record of increasing costs in these large-scale projects, it is hard to believe

that the \$20 billion estimate for the NJ-NY rail tunnels will not substantially increase. If the Hudson River tunnel project is supported, the public will pay more than current estimates assume.

Through informal discussions we also believe that that the tunnel project comes at a time when the public not only in this region but in many parts of the world face a serious budgetary problem associated with underfunded worker pensions.²⁵ Bond issues that seek to address the pension issue are likely to attract considerable opposition and could carry over to other bond votes, such as the tunnel project.

If there is scrutiny of a bond issue, then one would expect hostility toward a user fee, which is a form of tax on service. The academic and political literature about taxes is voluminous, with a basic axiom running through: people are generally hostile to taxes. Mehrotra provides context for the current dispute over taxing in the United States.²⁶ He writes that the United States changed its tax system in the 20th century from protecting property rights to progressive income taxes in order address needs of the poor. Arguably, some of the stress on taxes in the 21st century is a revolt against what has been characterized as a Robin Hood-like taxing system that has existed for barely a century.

Among taxing options, however, a user fee might be appealing to some members of the public. For example, in New Jersey, a recent study examined public support for bonds and various forms of taxes to support cleanup of areas of the state devastated by hurricanes Irene and Sandy.²⁷ Forty-two percent of respondents supported the idea of a bond paid out over 30 years to help rebuild devastated areas. In comparison, only 24%, 19%, and 14% favored small sales, income and gasoline tax increases limited to 5 years, respectively. In contrast, 53% favored a 1% additional tax on hotels, motels, airports, and recreation facilities for five years – in other words, a user fee that would be paid by residents as well as people using state facilities had the most support.

Hence, while taxes are quite unpopular, in this case, we expect modest support for a user fee, as well as modest support for bonds to pay for the tunnels. We expect modest, but not overwhelming support for either funding mechanism.

In regard to supporters and opponents of funding, our expectations began with self-interest.²⁸ Those who ride the trains through the tunnel, or have a family member who does would have a vested interest in supporting the tunnels. They would have a good reason to support bonds that are paid by the population for 20-30 years, and good reason not to support a user fee that they would have to pay. Similarly, respondents might not personally ride through the train tunnels, but perceive that the tunnels are important to their community (many suburban towns have stations that are tied to their local business sector), the state as a whole, and the larger region between Washington DC and Boston MA. These respondents would have also good reason to support both bonds and a user fee.

Some respondents are closely attuned to the importance of transportation. These should favor a full spectrum of transportation-related projects to build new roads, bridges, public transit, and increase the resilience of the transportation system to natural and human hazard events. These respondents would logically support a bond issue that included a variety of transportation projects, including the tunnels. In contrast, those who do not have a vested interest in the tunnels or do not perceive one, nor an interest in other forms of transportation have no reason to support a bond, but might have a reason to go along with a user fee that will not cost them anything.

We anticipated that personal worldviews, values and preferences would help differentiate between supporters and opponents. At the political preference level, we would expect self-declared liberal-oriented respondents who favor wealth redistribution policies, and are accustomed to government programs for education, health, infrastructure and others to favor a bond issue that helps the collective population and can be considered egalitarian and humanitarian.²⁹⁻³¹ These attributes are often found more often among women, more affluent and educated.^{32, 33} The companion dynamic is that those who self-identify as conservative would be likely oppose any further bond debt. They would, however, be inclined to favor a user fee. These attributes tend to be found among older less affluent males.

In addition, we expected personal experiences and outlook could make a difference. Persons who are pessimists and do not see envision a better environment in the future would be predisposed to oppose an investment that would benefit the current and future generations.^{34, 35} In contrast, optimists should be more supportive of bonds that not only solve the immediate issue but add to the infrastructure for decades into the future. Lastly, we expected that first-hand experience with a hazard event that left strong distressing indelible so-called “flashbulb” memories³⁶⁻³⁸ would impact preferences. Those with strong memories of serious hazard events should choose to avoid the distress of economic and human health impacts of tunnel failures and shutdowns and therefore would support paying for the tunnels with either funding mechanism.

METHODOLOGY

Survey Questions and Research Variables

The survey was conducted in February 2016, about 3½ years after Superstorm Sandy caused water to seep into the tunnels (October 29, 2012), about two years after Amtrak management indicated that one or both of the tunnels would need to be closed, and about four months after the debate about how to pay for the new tunnels led to an agreement, in principle, among the federal government, the states of New Jersey and New York, and the Port Authority of New York and New Jersey about how much was going to the responsibility of each party.

To explore our first research question, we proposed to the respondent that New Jersey likely faces seven issues over the next five years: (1) improving access to health care; (2) limiting property taxes; (3) improving education; (4) building new train tunnels under the Hudson River from New Jersey to New York; (5) redeveloping areas of New Jersey devastated by Hurricane Sandy; (6) protecting open space; and (7) improving roads for automobile and truck traffic. Respondents then ranked each of the seven issues in terms of importance, ranging from very/somewhat important to very/somewhat unimportant, with “neither,” “don’t know,” and “refused” answers being accepted as voluntary responses. To prevent an order bias, the order of the ranked statements was randomized.

These questions allowed us to create a tunnel relative importance question, which we later used as an independent variable. The scores for each of the six non-tunnel “importance issues” were added and divided by six to yield a mean value, which was then subtracted from that respondent’s score for the tunnel importance question. Those rating the tunnel more important than all of the other six issues, scaled at greater than 0. In practical terms, strong supporters of the tunnels should have a positive value on this variable, or at least a negative number approaching zero.

With regard to funding various critical infrastructure issues, we asked: “Just based on your everyday experience, if a state transportation bond issue were put forward—meaning, if New Jersey were to sell bonds to raise money—on a scale of 1 to 4, where 1 is “the most support” and 4 is the “the least support,” how supportive would you be of funding each of the five following items:” (1) investing in new roads; (2) investing in public transit; (3) maintaining existing roads and public transit; (4) building new train tunnels from New Jersey to New York; or (5) protecting roads and public transit from future disasters such as hurricanes, floods, and storm surges. As before, the five issues were randomized to avoid an order bias, and “don’t know” and “refused” were accepted as voluntary, i.e., non-prompted responses.

The second proposed funding mechanism was a “user fee,” which we defined as “an additional charge to fund a public service that is added to an existing cost.” We went on, in the root of the question, to explain that, “in this case, that additional charge would be added to the ticket fees for users of New Jersey’s trains that pass through the New York / New Jersey tunnel.” We then probed whether, and if so, how strongly, the respondent agreed or disagreed with the user fee proposal. As before, voluntary responses of “don’t know” and “refused” were accepted. In addition, because we expected some respondents to be concerned about all types of transportation-related issues, we removed the rail tunnel issue, and simply aggregated the scores of the other four to obtain a non-rail transportation support question, to be used as an independent variable similar to the tunnel relative importance question.

Because we reasonably expected train users to be disproportionately interested in the tunnels, we asked respondents to tell us how often they take the train between New Jersey and New York City. While very few took tunnels three or more times per week, many took it at least once or twice a month, and these measures were used to differentiate between train users and non-users. A key limitation of this question is that the respondent’s degree of use may not reveal the degree to which the respondent values the tunnels. Accordingly, we asked respondents about the direction and intensity they rank the tunnels are critical “to me and my family,” “to my community,” “to the New Jersey economy,” and “to region between Washington DC and Boston.” Again, “don’t know” and “refused” were accepted as voluntary responses. Finally, in terms of transportation activity, we noted that some respondents who use the tunnels also use other transit modes, such as buses, light rail or street cars, a ferry, subway. Those who said that they used any of these to travel to work were anticipated to express support for funding the tunnels.

As noted above, personal attributes, preferences, and values should influence views of building the tunnels. Worldviews are one factor; while some people tend to be individualistic, that is, they concentrate on their needs and a few that are very important to them, others are oriented to the needs of society as a whole, including its least affluent and powerless members. To explore these personality dimensions, we asked three well-honed commonly used questions that should also be associated with support for building the tunnels. We hypothesized that those who (1) believe that discrimination was still a serious issue, (2) favored a more equal distribution of wealth, and (3) disagreed with the assertion that too many people expect society to do things for them that they should do for themselves, would, as a component of their worldview, support funding these tunnels. We also expected optimists and self-identified liberals to support the tunnel project, while we anticipated that self-identified conservatives and pessimists would not be favorably predisposed to investing in the tunnels. Hence, to capture optimism, we asked them to tell us if they think the environment would be better, the same, or worse in 25 years, to capture

political spectrum location, we asked respondents to self-identify as conservative, liberal, or between.

Global climate change, considered by many to be the most serious long-term environmental challenge, has also been assumed by many as the primary cause of Hurricane Irene in 2011 and Superstorm Sandy in 2012, although this assertion cannot be proven. There is, however, no doubt that such massively powerful storms constitute an intergenerational threat to infrastructure, such as the tunnels. To explore this potential connection, we asked if recent extreme adverse weather in New Jersey had changed respondents' opinions, i.e., most notably whether it had increased their level of concern. Those who resisted becoming more concerned after these two storms, we believed would also resist viewing the tunnels as an intergenerational threat worthy of receiving their financial support.

Previous studies show that some people can remember in great detail about how large hazard events evolved and others cannot.³⁶⁻³⁸ One question was used to explore whether, and if so, to what extent, these deep-seated memories of past devastating events would be linked to support of the tunnels project. In this case, we examined the relationship between flashbulb memories of Hurricane Katrina, the most devastating storm measured by costs and support for funding the tunnels. Respondents were asked how much they remembered about this hazard event. Response options ranged from "don't remember anything," to "remember a few details," to "remember many details," and to "remember many details and I clearly remember where I was when I learned about it." Those who could remember details, including where they were, have flashbulb memories, and we expected those respondents to be more concerned about major hazard events that might follow a tunnel failure.

The final set of questions assumes that those with greater financial resources would more likely support funding the tunnels. We expected that relatively affluent, educated, self-identified as whites, and younger people who view themselves as long-term users of the rail service between Washington, DC and Boston, would be disproportionately represented in the more supportive groups. For this reason, we asked respondents their income, educational achievement, race and ethnicity, gender, and age.

Survey Administration

Because of the rapid, dramatic American dependence on cellular phones, telephone survey sampling designed to generate population estimates,³⁹ now requires a dual-frame sample, i.e., some proportion of randomly-generated cell-phone numbers must be added to the traditional random-digit-dial sample frame.

Our question set was part of an omnibus survey fielded by the Rutgers Eagleton Center for Public Interest Polling, using live callers, on February 6 through 15, 2016. The random probability survey yielded fully completed interviews with 889 New Jersey adults, non-institutionalized, 18 or older, with 471 sourcing to landline (53%), and 418 sourcing to cellphone respondents (47%). For landline contacts, within-household randomization involved asking, randomly, for the youngest adult male or female currently available; if the gender request was not available, the youngest adult of the other gender was interviewed. A Spanish language version of the questionnaire was available.

The total sample used was 35,298 telephone numbers; no contact (whether by way of no answer, busy signal, or answering machine) was made with 21,741 of those numbers. Another

8,141 were deemed ineligible to participate (due to being disconnected, not residential, not in New Jersey, or otherwise), and 264 were contacted but due to an inability to communicate with the within-household respondent, eligibility was undetermined. Of the remaining 5,152 potential respondents, 4,263 refused or broke-off a partially completed interview, and the remaining 889 gave fully completed interviews.

A raking algorithm was used to weight the data so that the sample would better reflect the basic population parameters of New Jersey: sex, race, age, and Hispanic ethnicity. Weights were trimmed at the 5th and 95th percentile to avoid the potential that any one case or small set of cases would unduly influence the estimates. The unadjusted sampling error for 889 sample respondents from New Jersey's statewide population is +/- 3.3 percentage points at 50/50 proportions with 95% confidence.

The weighted sample was 52% female, 48% male; 60% white, 12% black, 18% Hispanic, and 10% Asian/other/multi-racial. Roughly one third—32%—reported Democrat party affiliation, 17% report Republican party affiliation, and 52% reported they were politically “independent.” For analytical purposes, however, because using survey weight can inflate, sometimes substantially, the variance of the model parameter estimates, we used the unweighted data.⁴⁰

Analysis

To explore the first research question, i.e., the importance of the tunnels and comparison of that importance to other issues in the state, we used basic descriptive statistics and difference-of-proportions and means tests. In this way, we could get a rough-and-ready assessment of how important the tunnels are to the population, and how the public compares the importance of the tunnels to other issues. This approach was also ample to address the second question about the scope of public support for New Jersey's share of the cost of the new tunnels. The third question however—by which we sought to categorize respondents into “supporters” and “non-supporters” of different funding mechanisms, and understand their characteristics—required an additional, more sophisticated analysis.

So, following the initial descriptive reconnaissance, the logic of our analysis proceeded on the assumption that there would be five natural groups: (1) supporters of both funding mechanisms; (2) opponents of both mechanisms; (3) supporters for bonds but not user fees; (4) supporters for user fees but not bonds; and (5) those who are “equivocal,” i.e., they would either manifest lukewarm support and/or mild opposition to both funding mechanisms. In fact, these five groups did emerge, and we then used the designation of the respondent to the category as the dependent variable and used multinomial regression analysis to fully explore the characteristics of members of each group. Hence the main focus of the results section is in regard to the outcomes of the multinomial regression.

FINDINGS

Question 1: Importance of Tunnels

While Table 1 shows that 82% of respondents indicated that the tunnels were “very” or “somewhat important,” that number should not be taken as a ringing endorsement of building of new tunnels. While 40% indicated that the tunnels were “very important,” when compared to the “very important” ranking of for the other policy issues, the tunnels are actually last ($p < .01$).

RUNNING HEAD: *Understanding the Public's Willingness to Pay*

- Improving education, 86%
- Improving access to health care: 77%
- Improving roads for automobile and truck traffic: 75%
- Limiting property taxes: 69%
- Redeveloping areas of New Jersey devastated by Hurricane Sandy: 64%
- Protecting open space: 61%
- Building new tunnels under the Hudson River from New Jersey to New York: 40%

TABLE 1. Priority: Importance of Building Tunnels Between New Jersey and New York During the Next Five Years, New Jersey Residents, February-March 2016*

Response Options	Number	%
Very important	348	39.9
Somewhat important	376	43.2
Neither important or not important	32	3.7
Not very important	79	9.1
Not important at all	36	4.1
Total	871	100.0

*Excludes less than 2% of respondents who refused or did not know.

Question 2: Willingness to Support Issuance of Bonds and/or a User Fee

Tables 2 and 3 show moderate support for tunnel funding via bonds or a user fee. Sixty percent supported a state bond and 54% supported a tunnel user fee, but more supporters were lukewarm than very supportive. It certainly appears that the public has not been persuaded that the tunnels are even close to the most important issue to be dealt with during the next five years.

TABLE 2. Willingness to Pay for Bond to Support Tunnel Construction with a State Transportation Bonds, New Jersey Residents, February-March 2016

Response options	Number	%
1- Most support	269	31.1
2	251	29.0
3	210	24.2
4-Least support	136	15.7
Total	866	100.0

*Excludes 3% of respondents who refused or did not know.

TABLE 3. Willingness to Support User Fee to Replace Train Tunnels, New Jersey Residents, February-March 2016*

Response options	Number	%
Strongly agree	179	20.4

Somewhat agree	298	34.0
Neither agree or disagree	17	1.9
Somewhat disagree	151	17.2
Strongly disagree	232	26.5
Total	877	100.0

*Excludes less than 2% of respondents who refused or did not know.

Accordingly, rather than treat all support as equal, the analysis distinguished between strong support and some support. Table 4 divides the respondents into five groups based on strength of support for bonds and users fees, with about half of the respondents fitting into one of four “strong support” or “strong opposition” groups. The other half fit into a group that we dubbed “lukewarm support and opposition”—these are the “equivocal” respondents we hypothesized above.

TABLE 4. Support for Two Funding Mechanisms, New Jersey Residents, February-March 2016

Funding Support Group	Number	%
Strong Support for Bond and User’s Fee	67	7.6
Little Support for Bond or User Fee	181	20.6
Strong support for bond but not for user’s fee	125	14.3
Strong support for user’s fee but not for bond	61	7.0
All other responses	443	50.9
Total	877	100.0

Question 3: Associations with Support for Bonds and/or User Fees

Table 5 presents the results of a multinomial regression analysis of willingness to pay; the nominal dependent variable is the “support category” to which respondent was classified, with the lukewarm-equivocals serving as the reference group. To simplify the output, we present three numbers for each category across the 25 variables in the table: the variable’s beta coefficient, its standard error, and the chi-square value for that variables likelihood ratio test. Cells that contribute significantly ($p < .01$, $.05$, and $.10$) are highlighted in grayscale. As noted, the comparison group for the model is the “lukewarm” group, which consists of about half of the respondents (Table 4). The beta coefficients should be interpreted relative to the lukewarm group.

Strong Support for Both Funding Mechanisms

The first column in Table 5 presents relative impact of each independent variable on the dependent variable category representing the 67 respondents that support both funding mechanisms. Not surprisingly, those that strongly support the bond and the user fee options believe that the tunnels are the most important state investment during the next five years, even more than investing in other long standing important issues such as health care and education. These respondents also believe that the tunnels are important to the region between Washington DC and Boston, and are strong supporters of transportation, as indicated by the positive association of the non-train tunnel transportation variable.

Demographically, while self-identified Hispanics constituted less than 17% of the sample overall, Hispanics constituted 26% of this strong support group. Three other strong correlates mark the group. First, they do not self-identify as conservative; indeed they disproportionately self-identify as liberals. Second, these supporters of both tunnel funding mechanisms believe that the country would be better off with more wealth redistribution, and third, they do not agree with the statement that people expect others to do too much for them. Both of these last two correlates indicate a greater propensity for communitarianism and an active social welfare state.

TABLE 5. Multinomial Regression Analysis of Support for Bond and User Fee#

Variable	Strongly support both bond & user fee (n= 67, 8%)		Strongly oppose both bond and user fee (n= 181, 20%)		Strong support for user fee & strong opposition to bond (n= 61, 7%)		Strong support for bond & strong opposition to user fee (n= 125, 14%)#		Likelihood ratio tests, Chi-square
	B	SE	B	SE	B	SE	B	SE	
RAIL INTEREST									
Train user	-.344	.434	.764***	.270	.427	.455	.266	.304	10.57**
Transit user	-.330	.471	-.577	.352	-.945	.702	.382	.328	7.40
Tunnels critical to me & my family	.198	.357	.443*	.255	-.773	.574	1.12***	.267	23.29***
Tunnels critical to my community	-.155	.362	-.121	.230	-.648*	.383	.195	.285	4.25
Tunnels critical to NJ	.433	.473	-.702***	.229	-.722**	.335	-.410	.332	14.80***
Tunnels important to region between Washington, DC & Boston	.790*	.366**	.198	.213	.308	.324	.377	.253	6.70
Closely follow news about tunnels	.297	.329	-.465**	.210	-.268	.321	.327	.254	9.34*
Tunnel key investment for NJ during next 5 years	1.93***	.372	-.415*	.235	-.689*	.412	1.14***	.269	60.11***
Tunnel investment more important than other issues	2.03***	.432	-.677***	.208	-.310	.319	1.07***	.286	60.4***
Important to invest in non –rail transportation infrastructure	1.65***	.389	.182	.231	.115	.341	-.556*	.319	23.09***
DEMOGRAHICS, VALUES, PERCEPTIONS									
Family income <\$75,000	.086	.336	-.390*	.216	-.534	.346	-.056	.259	5.18
Hispanic respondent	.866**	.404	.765**	.271	-.354	.450	.061	.329	11.29**
Black respondent	-.232	.506	.913***	.299	-1.13	.811	.597**	.328	17.97***

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Attended graduate school	.295	.395	-.230	.263	-.259	.379	.497*	.302	4.54
Did not graduate high school	-.226	.382	-.155	.231	-.532	.407	.131	.293	3.92
Female respondent	-.066	.303	.306	.195	-.257	.297	.435**	.236	1.66
Respondent ≥50 years old	.126	.320	-.098	.207	.328	.315	-.228	.249	3.63
Self identifies as conservative	-.332	.452	.235	.256	.291	.385	.325	.330	4.10
Self identifies as liberal	.351	.467	.126	.336	-.616	.481	.219	.392	2.16
Environment will improve during next 25 years	.237	.334	-.445* .241		.465	.330	-.531** .277		11.41**
Believe in global climate change and Sandy increased relief	-.104	.358	-.680*** .212		-.726** .328		-.195	.252	21.02***
Recall details of Katrina & what s/he was doing at the time	-.188	.334	-.452** .204		.452	.308	-.343	.253	9.82**
Belief in wealth redistribution	.491	.352	-.250	.223	.281	.355	.124	.266	3.28
Discrimination still a problem in U.S.	-.076	.345	-.250	.217	.072	.327	.574**	.279	7.22
People expect others to do too much for them	-.344*	.416	.080	.227	.400	.350	.270	.272	4.41
Intercept	-.428 1.109		.611	.732	-5.38 1.43		1.97	.815	

Nagelkerke pseudo-r2 was .420, Cox and Snell was .390, Chi-Square was 440.0.

***Statistically significant correlate $P < .01$, ** $P < .05$; and $P < .10$.

#Comparison group was lukewarm group (n= 443).

Among the four dependent variable groups, this “support both” category ranked first or second in the key associated attributes, with the exception of the conservative label; there, it rated low because, after all, these are primarily liberal-leaning people. Indeed, 39% of this group’s members self-identified as “liberal” compared to 21% all of the other respondents.

Summarizing, this dual support group is defined by their strong sense that the tunnels are important, more important than other needs, and these respondents disproportionately appear to be optimists with regard to the notion that the state can be a positive actor in people’s lives.

Strong Opposition to Both Funding Mechanisms

The second data column of Table 5 identifies multiple attributes that characterize the larger group of 20% of respondents who favor neither funding mechanism. While they are

disproportionately rail tunnel users and believe the tunnels are important to them and their family, they tend not to follow the news about the issue, they do not think that the tunnels are important to New Jersey, and consider the tunnels to be a less critical investment than education, health care, property taxes, and the other issues described earlier.

These respondents tend to be female, Hispanic, Black, and not poor. Compared to their counterparts, they do not expect the environment to improve during the next 25 years, nor did the destruction caused by Hurricane Sandy increase their concerns about global climate change; moreover, they recall few details about Hurricane Katrina.

In short, despite their acknowledgement that that the tunnels are important to them, the members of this group are not anxious to financially support them, which may be consistent with their pessimistic views of the environment, lack of response to global climate change and to Katrina. From these few questions, they appear to not favor aggressive government interventions.

Strong Support for a User Fee but Strong Opposition to Bonds

The third data column of Table 5 identifies the attributes of dependent variable category of the 61 respondents that support a user's fee but not a bond. The four statistically significant variables identify this subpopulation as not persuaded that the tunnel project is important to NJ and to their community, and therefore not a high priority for state investment during the next five years. They were not persuaded by Superstorm Sandy to be more concerned about global climate change.

Although not statistically significant in the multinomial regression, five additional variables were added to these to frame out the attributes of this group. This group had the highest proportion of respondents reporting conservative, and the second lowest reporting, liberal ideology; in addition, this group had the second highest proportion of persons 50+ years old, as well as the highest proportion of male whites. In other words, this group has taken a fiscally conservative position that users—individuals—should pay for service rather than government, which is consistent with individualistic-oriented individuals.

Strong Support for Bonds but Strong Opposition to a User fee

Several of the markers of the dependent variable group that supports a bond issue but not a user fee are predictable on a common sense basis: The respondents believe that the tunnels are important to them and are a key investment; however, they would like government to secure bonds so that the cost is paid by the population as a whole, not by them. What is demographically interesting about this group's distribution is that those who disproportionately favor this option self-identify as black, graduate school educated females.

CONCLUSIONS

This study presents both positive and negative outcomes for those who would like the public to place a high priority on rebuilding the train tunnels. The clear positive message is that

80% of the population thinks rebuilding the tunnels is important and 80% are willing to support state bonds and/or a user fee. Somewhat more ambiguous is that while the issue is certainly on the public's collective radar screen, it is not prominent compared to property taxes, road transportation, health care, and other complex public issues. Measured by the proportion of respondents indicating "strong public support," the tunnel project ranked last at 40%, while the "strong public support" metric for other issues ranged from 61% to 86%. Furthermore, while 20% strongly opposed either revenue generating mechanism only 8% strongly supported both funding mechanisms. Another 21% strongly favored one but strongly opposed the other funding mechanism. This means that half of the respondents demonstrated either modest support or modest opposition to bonds and the user fee. Another way of looking at these results is that there is evidence that half of the population could be persuaded to take a stronger position, whether pro or con.

It helps to understand the composition of the groups we found. Strong supporters of both funding mechanisms recognize the importance of trains, other forms of transportation, and of the other key policy issues; they disproportionately self-identify as liberal, persuaded that at least some wealth redistribution is appropriate, that discrimination is an issue, and they tend to be optimists. The much larger group that opposes either source of funding is disproportionately composed of train tunnel users and, ironically, they admit that the tunnels are important to them and their family. Their acknowledged interest, however, ends at that point. They do not report following news about the tunnels, nor do they believe that the tunnels are important to the surrounding regions. They are pessimists and do not have, or do not admit to having, recollection about previous major risk events.

The strong bond supporters who oppose a user fee are frequent train riders who closely follow news about the rain tunnels. While they favor the state paying its share with bonds, they do not want to add a user fee. The "opposite" group, i.e., that strongly favors a user fee and strongly opposes bond issues, tends to be older, male, white and not persuaded that they should contribute to a service from which they personally and their family do not benefit. The half of the population that forms the lukewarm/equivocal group appears as an aggregate of the other four groups, with two important exceptions: they were much less likely to use the train tunnels, and less likely to recognize its importance to them; neither of those findings can be considered a good signal for project proponents.

Before considering the implications of these findings for policy formation, we note several important study limitations. First, this is only one statewide study with a sample of slightly less than 900. We believe that public preferences will change depending upon what policy processes are used to inform them, or to limit their access to information. Hence, we strongly recommend follow-up surveys, with an oversample in communities with rail stations. Optimally, such an extended study would include communities not only in New Jersey but along the entire Northeast Corridor, here considered the rail line between Washington, DC and Boston MA. Moreover, given these findings, it would be valuable to have focus groups with respondents who fit each of the five identified categories to provide a more nuanced understanding of the survey outcomes. Doubtless, there are other factors driving these groups, and these can best be found by talking directly with people, especially people who should have a stake because of their use of the rail tunnels and their location near stations. Such sessions should probe other funding mechanisms or a hybrid of the two tested in this survey.

With these caveats noted, assuming no serious failure of the tunnels and no concerted effort to build support for the tunnels, our expectation is that public interest will decline as other policy issues come to the forefront. Frankly, if elected officials and rail organizations believe that public support is needed the current level of discourse needs to be increased. First, we acknowledge that the decision-making stakeholders may believe that active public support is not essential, that is, the federal government will recognize the importance of these tunnels and will take over any payments that the states cannot provide. It is hard for us to accept that possibility in the current political climate. As noted earlier, reports routinely appear that the combination of paying for retirement benefits, health care, pensions and other mandated programs, as well as repaying debt is absorbing an ever-increasing proportion of government revenue not only in New Jersey and the United States, but in many other countries, as well. Added to this constraint on funding is a tendency to pair off populations against one another in political debates. While the rail tunnels are important to certain people and to their surrounding regions, in a zero sum political world, it is not difficult to foresee a new federal government leadership favoring other programs in other parts of the United States over this major investment in this area.

RECOMMENDATIONS

We suggest that two activities will raise the level of perceived importance of the tunnel project. The first is gathering data that estimates human health and safety risk. This should occur through the environmental impact statement process subject to all of the quality control mechanisms that expert triangulation and peer-review can provide, as well as through appropriate engineering and maintenance inspections. If one of the tunnels will have to close in the near future, credible data are needed to show whether that closing will be needed in six months or six years. We recognize that current passengers might be frightened by the prospect of a failure while they are in the tunnels. However, we need to determine the probability of various failures from small to catastrophic, if any, and under what circumstances such failures could occur. If there is no meaningful probability of such an event, then those reassuring data should be produced.

The second and we believe more difficult challenge is sharing the information—not just other government officials and lending institutions—but with members of the public in ways that they can understand the risk of, for example, following a slow construction schedule versus a more rapid one. Whatever the risk analyses and environmental impact statements find must be made public as this is the dominant, if not only, way that government and the rail systems can build public trust that will lead to more support for management in regard to their competence, communications and values.

We believe that government and non-government managers should create a process that places them in regular contact not only with each other at the operational level, but that also reports to the public and their representatives on a regular basis. We believe that the longer it takes to build a public process, the more likely, unless there is a major hazard event, that the public will lose interest, stop being concerned, and find something else on which to focus.⁴¹ Managers need not start from scratch. Proponents of school funding, housing, and infrastructure have written extensively on how to build public support by using the media, websites, town meetings, newsletters and many others.⁴²⁻⁴⁵ People need to know what the experts know—and

what the experts do not yet know—about the risk and consequences; they need to know how much it will cost them if they have to pay by a bond or pay with a user fee; and they need to know how they can get more information and participate if they want to. Even if the tunnels need no work at all for a decade, it is not too early to build public support.

Human Participant Protection

The survey that provided the data for this research was reviewed and approved by the Rutgers University Arts and Sciences Institutional Review Board on February 1, 2016, under protocol number E16-425.

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