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**EARMARKING IN THE US
DEPARTMENT OF TRANSPORTATION
RESEARCH PROGRAMS**

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Abstract

US Department of Transportation research funds historically have been awarded on the basis of competition and merit review. Over the last fifteen years, however, transportation research programs have seen dramatic growth in earmarking, a practice in which Congress designates research funds for specific institutions named in legislation. This paper discusses driving forces for and potential risks associated with this practice and presents data on earmarking trends from five USDOT agencies.

1. Introduction

The United States government has long supported transportation research and innovation in areas ranging from materials and design to safety, environmental protection and development of alternative fuels. Since its establishment in 1967, the US Department of Transportation (USDOT) has funded much of the country's research into highway, transit, aviation, rail, and marine transportation. USDOT research programs are carried out by the department's own staff and by private and academic institutions that typically compete for research projects. However, over the last ten to fifteen years, transportation research programs have seen dramatic growth in earmarking, a practice in which Congress determines that certain research centers or projects should be located at particular institutions named in legislation. In some cases, research funding is earmarked for non-research activities.

Earmarking, the practice of directing funds to named recipients for purposes designated in legislation, is not new. Legislators have long designated funding for highway and transit projects to their home districts. Arguments in favor of this practice stress the responsibility of elected officials to address needs expressed by their constituents. A major objection to the practice is that projects favored

for political reasons may not be the most cost-effective investments of public funds, in part because earmarking bypasses well established planning and evaluation processes, including citizen involvement. In most cases the processes being bypassed by Congressional earmarks have been created by Congress itself.

This paper examines earmarking of USDOT research funds and includes data from five of the department's agencies: the Federal Highway Administration (FHWA), the Federal Transit Administration (FTA), the Federal Railroad Administration (FRA), the Federal Aviation Administration (FAA), and the Research and Special Programs Administration (RSPA). These agencies account for 85% of the department's research budget over the FY 2000 to FY 2004 period.

There is no single repository of data on congressional earmarks in transportation so data were acquired through several sources that sometimes used different definitions. Data were compiled from: books and articles; several modal administrations of the USDOT, congressional reports, a compendium on earmarking published in *The Chronicle of Higher Education*, and annual analyses of federal research funding conducted by the American Association for the Advancement of Science (AAAS).

2. Definition of Earmarking

Earmarking of transportation research funds occurs when Congress designates all three of the following elements: a research area or project, a funding amount, and a recipient, that is, an institution that will receive the funds to perform the research. The last element of a congressional designation, the recipient of the funds, is the most critical one in our definition and yet also the one that contributes most to ambiguity. Congress may designate a recipient in several ways. The clearest designation occurs when the recipient is actually named in legislation. In some cases, the recipient is not named in the legislation, but in accompanying report language. Although report language does not have the force of law, agencies generally treat designations in

report language as if they do. In some cases, the recipient is not named at all but is described, in the law or report language in such a restrictive manner that only one recipient could meet the criteria. In other cases, Congress makes it known to an agency through informal channels exactly who was intended to receive funds provided by the legislation (Brainard 2001). In the end, the effect is the same: a federal agency knows that it must provide a certain amount of funding to a particular recipient to avoid repercussions, perhaps in future appropriations. Most of the data discussed in this paper refer to earmarks involving a recipient named in legislation or report language.

3. Competition and Peer Review

Discussions about earmarking take place in the context of a principle, long held in scientific circles, that the competitive award of research funding based on the judgment of scientific peers is the best way to ensure high quality research. Research is a quest for new knowledge and solutions to unsolved problems. Despite its standards and protocols, research is fundamentally about innovative thinking. It requires a high degree of expertise, often shared by a fairly small number of colleagues with similar education and research or technical experience. Because of the specialized expertise and the insight required, high quality research is not easily discerned by a standard test or a predetermined procedure; it is best assessed by scientific and technical peers. Concern for quality assurance is part of a culture of science that has long believed that science should be as free as possible from political or other “extraneous” influences so that the reliability, accuracy, and objectivity of results can be maximized. Though a realistic assessment of science reveals that it is subject to all the same types of influences to which other human enterprises are subject, the ideal of minimizing non-scientific impacts on results remains a central tenet of the research culture.

Legislatures have always designated research funds for particular purposes, such as traffic safety, pavement improvement, or transportation demand management, but historically they have left the selection of researchers to processes of peer review. Review processes, like those used by the National Science Foundation (NSF) and the National Institutes of Health (NIH), incorporate measures that attempt to avoid awarding research funds on the basis of friendships, influence, political connections, or the results of lobbying. Instead, the tradition of open competition and peer review has been considered the best way to arrive at research funding decisions. Announcements are widely circulated that encourage researchers to study and solve particular problems. Experts in the field anonymously review proposals and budgets prepared by other researchers and recommend the most promising for selection. Frequently, peers decline to fund particular research proposals but offer extensive suggestions as to how the proposals can be improved in order to obtain more favorable review. The “revise and resubmit” process is one of the mechanisms by which the quality of scientific inquiry is gradually improved.

4. Earmarking of Federal Research Funding: Driving Forces

Concerns about earmarking of federal research funding arose in the 1980s as a growing number of universities sought federal funding through direct appeal to political contacts rather than the customary competitive processes based on peer review of proposals (Savage, 1999). While in earlier years some earmarks had been provided by members of Congress to their states’ universities, over the last two decades universities began to hire lobbyists to assist them in obtaining earmarks. Out of a total of about \$127 billion in research funding from federal sources for all purposes in FY 2004, almost \$2 billion was earmarked for research at universities (American Association for the Advancement of Science, 2004). Some individual universities

have received as much as \$300 million in earmarked funds in fifteen years (ASCE Prism Online, September 2001). Figure 1 shows the distribution of research earmarks among federal agencies for fiscal years 2001, 2002, and 2003. The USDOT accounts for 8% of research earmarks in these years. The driving forces behind earmarking and the reasons given by those who seek earmarks are summarized in this section.

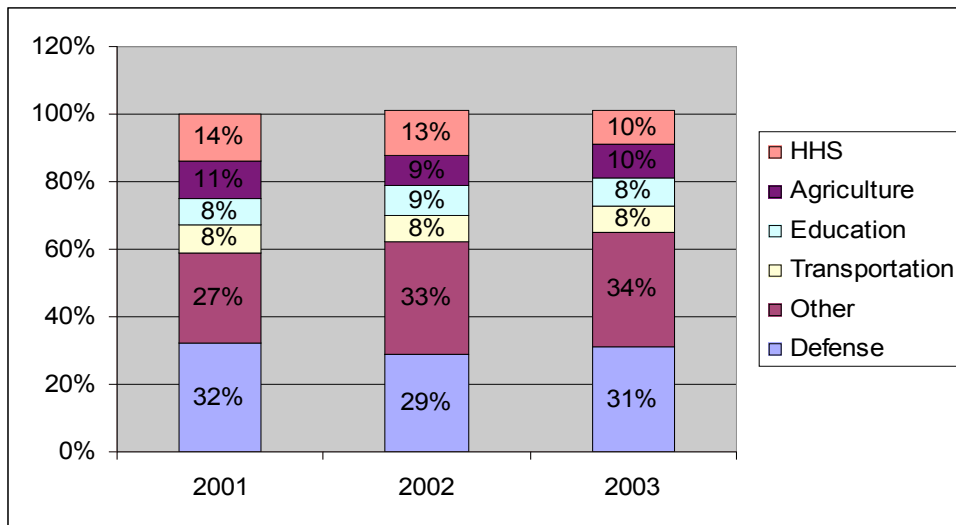


Figure 1: Distribution of Research Earmarks Among Federal Agencies, Fiscal Years 2001, 2002, and 2003

Data source: *Chronicle of Higher Education*, <http://3/chronicle.com/stats/pork/>

4.1. *Quality or Elitism: Biases in the Peer Review System*

Open competition is believed by many to insure that an investigator chosen to undertake a particular research task has a track record of accomplishment and a staff qualified to carry out the work. A panel of peers can be expected to recognize a quality proposal and to understand the subtleties of competing research approaches. This allows inexperienced but creative researchers and those from a lesser-known institutions to defeat others in head-on competition. When a new competitor beats out experienced competition, the experienced universities may have been

resting on their laurels or may have prepared their proposals hastily and carelessly, or the new entrant can be onto a great idea that others simply missed.

Earmarking, on the other hand, is based more on the influence of the person or institution choosing to fight for the designation. It can happen that the designated organization includes researchers who are as highly qualified as any that might be chosen through open competition. On the other hand, it could be that the chosen organization's staff is inexperienced and less than fully qualified.

University administrators who pursue earmarks indicate that they are driven to do so by the injustices resulting from the peer review system. They feel their institutions are not getting their fair share of federal research funding because the peer review system is dominated by a clique of prestigious universities whose researchers, in their capacity as peer reviewers, recommend each other's work for funding. They believe that the system creates a vicious cycle in which universities that do not receive substantial funds from the federal government (the largest source of research funding in the US) cannot achieve the status necessary to compete well. John Silber, the former Chancellor of Boston University, made this argument while vigorously pursuing earmarks for his university. In a paper entitled "Earmarking: The Expansion of Scientific Excellence," Silber stated that in many fields his university some years ago could not compete head on with Harvard or Yale. He asserted that research funding is dominated by a few elite schools that are almost always chosen by peer reviewers because of their status. Panels are likely to include alumni of a few great schools, and the "schools of thought" that lead us to conclude that some approaches to a question are correct while others are wrong are likely to be the products of whom we know and where we went to school. Silber argued that earmarks to Boston University enabled it to become competitive over a decade or

more in fields to which it was new. Once it had mounted new programs as the beneficiary of earmarks, it was eventually able to compete on a more equal footing with the elites that previously were dominant (Silber, 2002).

This argument is easily extended to incorporate important matters of racial, ethnic, or geographic discrimination that might be inherent in the research dominance of a field by a small number of universities. A university serving predominantly minority students or one from an underdeveloped region may not be able to compete vigorously against a recognized elite university in a particular field. An earmark might make it possible for a previously unrecognized university to advance in a research area while open competition would have precluded their selection.

While Silber's argument has merit, many scholars disagree with him. In his book, *Funding Science in America*, James Savage (1999) found that the funding of programs through earmarking rather than through peer-reviewed competition made no difference in the long-term rankings of the universities that received the earmarks. His data show that many of the universities benefiting from earmarks also obtain large grants and contracts through competition. In fact, they often succeed in obtaining large competitive grants within the fields in which they also receive earmarks.

Committing funds to a particular university to spend within the boundaries of a particular field of study cannot guarantee intellectual accomplishment nor improvement in status. If the choice is not based on peer review, in fact, many believe that such funds have a higher likelihood of producing questionable results. Many argue that earmarking is an inferior way to overcome the elitism that Silber decries. Open competition for funds remains possible by creating contests that invite participation by previously non-participating researchers. Universities can be divided

into different classes so that few competitions pit experienced against inexperienced universities. Some competitions could reward promising developmental plans among new entrants into a field while others can be based on research track records of accomplishment.

4.2. Lack of Funding for Research Facilities

Others argue that earmarking is driven by the fact that federal agencies do not fund development of the facilities necessary to perform high-quality research. State-of-the-art research facilities can improve a university's chances of winning competitively-awarded research grants. While universities with well-established research programs are able to use a portion of the federal grants they receive to improve their research facilities, universities that are not receiving sufficient grant money in the first place do not have this funding source to improve their competitive position with respect to facilities. According to this argument, the only way to receive money for facilities is through earmarks, which are justified as a way of leveling the playing field for institutions that would subsequently compete for research grants.

In the context of research earmarking at the federal government-wide level, the issue of federal funding of university research facilities has played a significant role. In response to the increasing earmarking in the 1980s and 1990s, several attempts were made to establish federal programs for funding research facilities. Most of these attempts failed and the programs that did result were inadequately funded and had no discernable impact on earmarking trends (Savage, 1999, pp. 74-98).

In general, facilities do not appear to account for much of the earmarking in the five USDOT agencies highlighted in this paper. Data on earmarks from *The Chronicle of Higher Education* indicate that of the 611 university earmarks from the USDOT budget from 1990 to 2003, 113 (18%) were for facilities and equipment. A significant exception is the National

Advanced Driving Simulator (NADS), a \$50 million earmark from FHWA's program over several years to the University of Iowa (<http://www-nrd.nhtsa.dot.gov/departments/nrd-12/NationalAdvancedDriverSimulator.html>). This earmark was for the construction of a facility, rather than for particular research projects. University Transportation Centers (UTC) funding is not usable for constructing facilities, so this is not a rationale for earmarking in that program. Of the research earmarks in FTA, FAA, and FRA programs, none appear to be dedicated to facility development.

4.3. Special Cases

Proponents of earmarking have also argued that under many circumstances earmarking is the most rational path to efficiency and to the timely delivery of the products of research. Congress has several times enacted measures acknowledging that there should be exceptions to the practice of open competition for research funds. When it can be clearly documented that services desired by a federal agency are available from only one or a limited number of organizations, the federal agency is permitted by 41 USC 253(C) and 10 USC 2304(C) to bypass the broader requirement that there be open competition. This exception for sole sourcing is distinct from earmarking in at least two ways. First, sole sourcing is most likely to be carried out by executive branch agencies for program management reasons while Congress is more likely to create earmarks for political reasons. Second, sole sourcing must be justified in writing according to specific criteria and carried out by the executive branch according to prescribed protocols, while no such protocols or criteria exist for Congressional earmarks.

Where open competition would require that military secrecy be breached, competition is also not required. It is obviously not logical, appropriate, nor feasible to have open, competitive bidding for the selection of universities to participate in the development of nuclear weapons.

Very few transportation projects, however, require the secrecy or highly specialized knowledge that characterized weapons programs. While the need for such exceptions is well taken, this argument is difficult to apply to research on pavement, travel behavior, or intelligent transportation systems.

4.4. The Need for More Investigator-Driven Research

An additional force for earmarking in transportation is said to be the relative lack of availability of grants for investigator-driven, including unsolicited, research proposals. As a mission-oriented agency, the USDOT typically acquires research expertise through contracts and cooperative agreements specifying particular deliverables to be integrated into larger research and technology development efforts. These mechanisms are not generally conducive to basic research nor to more speculative or open-ended investigations that are the mainstay of academic research and doctoral dissertations. The argument for earmarks here is that they come with fewer contractual strings attached and provide for more intellectual exploration for academic researchers and their students. While there are no readily-available longitudinal data on university participation in USDOT research programs, a snapshot of FY 1995 reveals that only about 10% of the USDOT's research funding for that fiscal year (\$94 million) found its way to universities (Volpe 1997). Most of that funding was in the form of grants, but these still represent a very small amount of money for more innovative and open-ended research efforts. For comparison, universities performed about 22% of all federal research in FY 1995 (National Science Board 2002, table 4-5, p. A4-8).

One might argue that the University Transportation Centers (UTC) program was intended to address this problem. To some extent this has been the case; however, the majority of that program is earmarked and even the funding for which there is competition is dedicated to

specific institutions for several years, leaving no resources for which researchers at other universities can compete in between the years in which there are formal competitions. Another program that could have provided more scope for investigator-driven research is the advanced research program of FHWA. The advanced research program was authorized in TEA-21, but no funding amount was specified. In the face of significant earmarking in FHWA's research program, little freedom was left for the agency to allocate meaningful levels of funding for advanced research. Typical funding for the program was less than \$1 million per year during the period of TEA-21.

The USDOT is not the only player in federal transportation research. In FY 2002, the USDOT accounted for 43% of all federal transportation research funding, with the National Science Foundation, the Environmental Protection Agency, the Departments of Defense, Commerce, and Energy, and other agencies accounting for the remainder. From FY 2000 through FY 2002, NSF awarded approximately \$25 million per year for research directly aimed at transportation issues.¹ In FY 2002, the latest year for which data are available, the NSF funded \$200 million worth of basic research that may have a least some potential relevance to transportation.² This suggests that the need for grants for investigator-driven, transportation-related research may lie in redirecting university transportation researchers to the NSF rather than in earmarking mission-oriented research programs.

5. Earmarking in USDOT Research Programs

The impact of earmarking on federal research budgets depends on the scale at which one views the extent of earmarking as a percentage of research budgets. Despite the growth of earmarks in number and dollar value, they still account for a small percentage of overall federal

¹ Personal communication from NSF staff.

² From ongoing study of transportation research funding trends being conducted at the Transportation Research Board.

research funding. In FY 2004, the federal government-wide research investment was approximately \$127 billion, of which \$1.9 billion, or 1.5%, was earmarked. Some cabinet-level departments and independent agencies are virtually clear of earmarks, such as NSF and the Department of Health and Human Services, in which National Institutes of Health is located. On the other hand, the Department of Housing and Urban Development saw 28% of its research budget earmarked. In the same year, the USDOT appears to have 9.1% of its research budget earmarked, but these data only include appropriations earmarks (AAAS 2004). In FY 2003, for which both appropriations and authorization earmarks for the USDOT are known, the total came to 14% of the department's budget. Some USDOT agencies have seen earmarking in the range of 40% to 90% in any given fiscal year. Individual research program areas within USDOT have been entirely earmarked, or even over earmarked, that is, more funds are earmarked than appropriated. This section reviews the data on earmarking for the USDOT and several of its administrations, which together account for 85% of the department's R&D funding.

5.1. Department of Transportation

The growth in earmarking of USDOT research programs is illustrated in Figures 2 and 3. Figure 2 shows the number of earmarks from 1990 through 2003 as well as the total amount of earmarked funding, using data from the *Chronicle of Higher Education's* annual compilation of earmarks to academic institutions. Both the number of earmarks and the total amount of earmarked funding increase dramatically in the late 1990s. Figure 3 shows earmarked funding as a percent of the USDOT's overall research and technology funding for fiscal years 1995 through 2003.³ At the beginning of this period, earmarks to universities represented about 1% of

³ *Chronicle* data do not indicate the part of the DOT budget from which earmarks to universities are funded. To the extent that earmarks represented in Figure 3 were funded from other parts of the department's budget, the

USDOT’s program; by the end of this period earmarks reached 14% of the department’s research and technology funding. As with the number of earmarks and the earmarked amounts, a significant increase in the proportion of earmarked funds begins in the late 1990s, simultaneously with the passage of TEA-21.

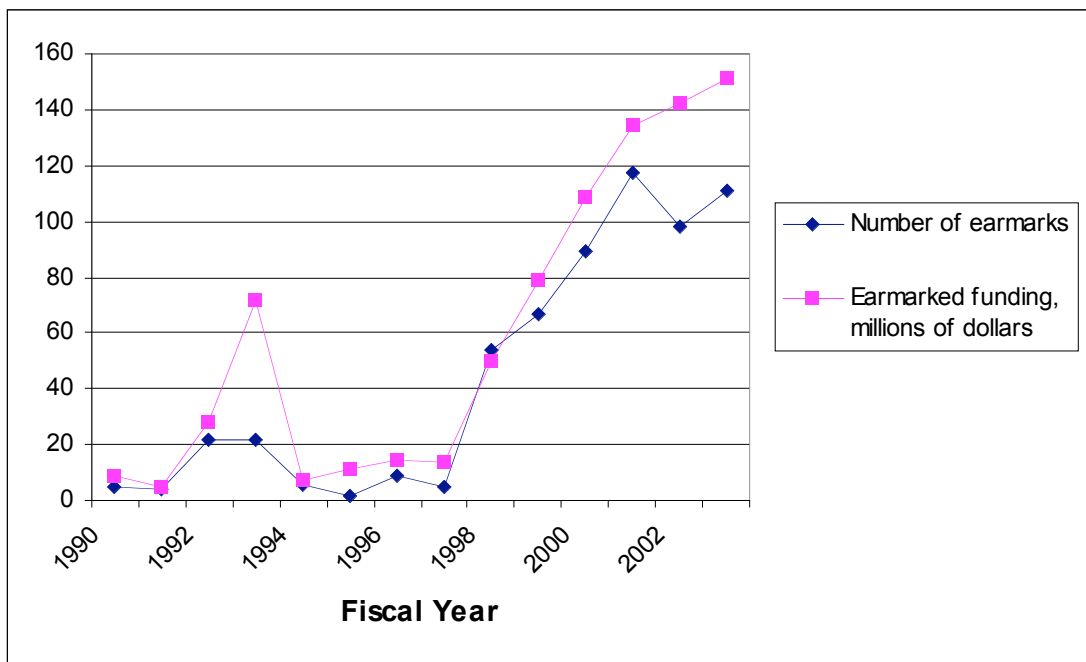


Figure 2: Earmarked USDOT Research
 Data source: <http://chronicle.com/stats/pork/>
 Note: Funding numbers are not adjusted for inflation; it is not clear if the funding reflects the obligation limitation.

5.2. Federal Highway Administration

In FY 1997, the last year prior to implementation of TEA-21, approximately 12% of FHWA’s research and technology deployment program was earmarked.⁴ This includes earmarks from both authorization and appropriations legislation. The remainder of FHWA R&T funding was dedicated to pursuing research, technology development, and technology transfer in support of the agency’s mission. In the years immediately prior to TEA-21, the majority of this funding

percentages shown are over-estimates. On the other hand, the *Chronicle* data do not include earmarks to nonacademic entities, so in this respect the percentages are underestimates.

⁴ Data in this section are derived from funding tables provided by FHWA.

was expended in the form of competitively-awarded contracts and other types of agreements with private firms and universities to perform agency-directed research. This research was carried out either at the selected researchers' institutions or at FHWA's own laboratory, the Turner-Fairbank Highway Research Center (TFHRC) in Virginia. A small amount also supported intramural research at the lab.

With the passage of TEA-21, earmarking increased significantly. Earmarks included in the six-year authorization legislation accounted for almost 19% of TEA-21 R&T funding. When earmarks from the annual appropriations process are added, the average level of earmarking during the TEA-21 years increases to 33% of the R&T program. Figure 4 shows the percentage of earmarking of the FHWA R&T program during TEA-21, with FY 1997 provided for comparison with ISTEA.

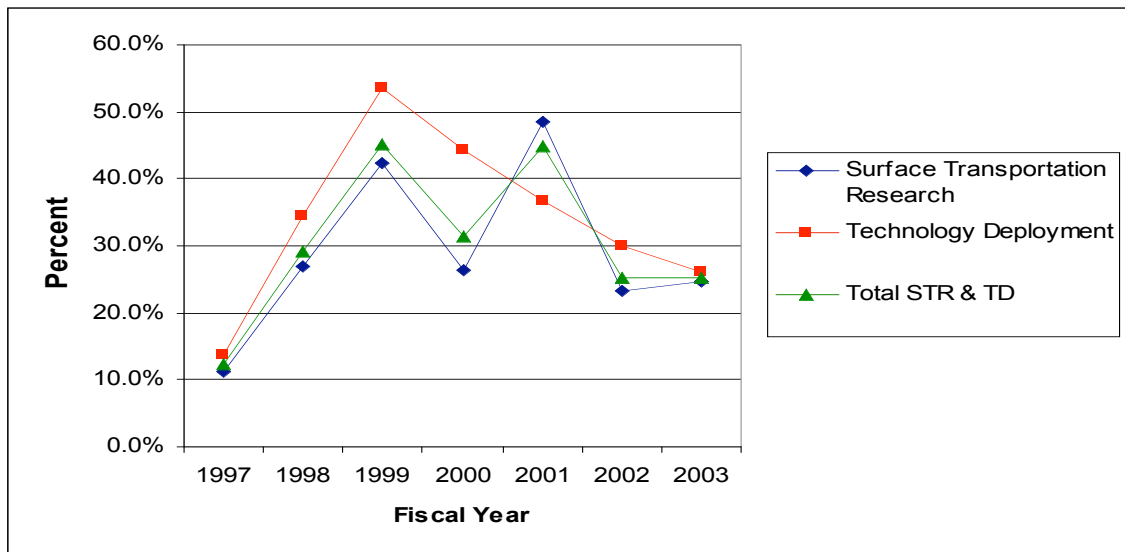


Figure 4: Earmarks as a Percent of FHWA R&T (without limitations applied)
Data source: FHWA budget tables.

Average earmarking during TEA-21, as high as it is, masks the dramatic impact of earmarking on particular parts of the R&T program. The structures, pavement, and safety

programs tended to receive more earmarks than the research programs dedicated to policy, environment, or planning. In FY 1999, 65% of FHWA's structures research program was earmarked. In the same year, the pavement research program received an appropriation of \$11.6 million but was expected to accommodate \$14 million worth of authorization and appropriations earmarks within this line item. Over the course of TEA-21, the technology deployment program saw earmarks in the range of 26% to 54%. These data reflect earmarked amounts as given in legislative and report language. Actual amounts were modified by several mechanisms. The first is the obligation limitation. This limitation is imposed on all programs funded from the Highway Trust Fund as a way of controlling federal expenditures. In each year of TEA-21, this limit was applied to all authorization earmarks. It was also applied to appropriations earmarks in fiscal years 1998, 2002, and 2003. This limitation did not affect the overall impact of these earmarks on the R&T program because there were proportional reductions in all funded programs.

However, in fiscal years 1999, 2000, and 2001, FHWA applied a separate limit on the appropriations earmarks. This was possible because appropriators agreed to specify the earmarks as "up to" a certain amount. The administrative limitation allowed FHWA to maintain minimum research operations in critical areas and keep core laboratories open. In addition, all R&T programs and earmarks experienced a federal government-wide rescission of 0.65% in FY 2003. Table 1 shows the limitations applied in each year. Figure 5 shows the earmarking percentages during TEA-21 once the limitations have been applied to the funding and earmarked amounts. In the final analysis, 29% of FHWA's R&T program was earmarked over this six-year period: 26% of the research portion of the program and 35% of the technology deployment portion.

Type of Limitation (applied to amounts given in legislation or report language)	Fiscal Year					
	1998	1999	2000	2001	2002	2003
Obligation limitation on authorization earmarks	90.0%	88.3%	87.1%	87.9%	90.4%	90.0%
Obligation limitation on appropriations earmarks	90.0%				90.4%	90.0%
Separate FHWA administrative limitation on appropriations earmarks		60.0%	50.0%	40.0%		
Federal government-wide rescission of 0.65% applied to all earmarks						99.35%

Table 1: Limitations Placed on FHWA R&T earmarks
Data source: FHWA budget tables.

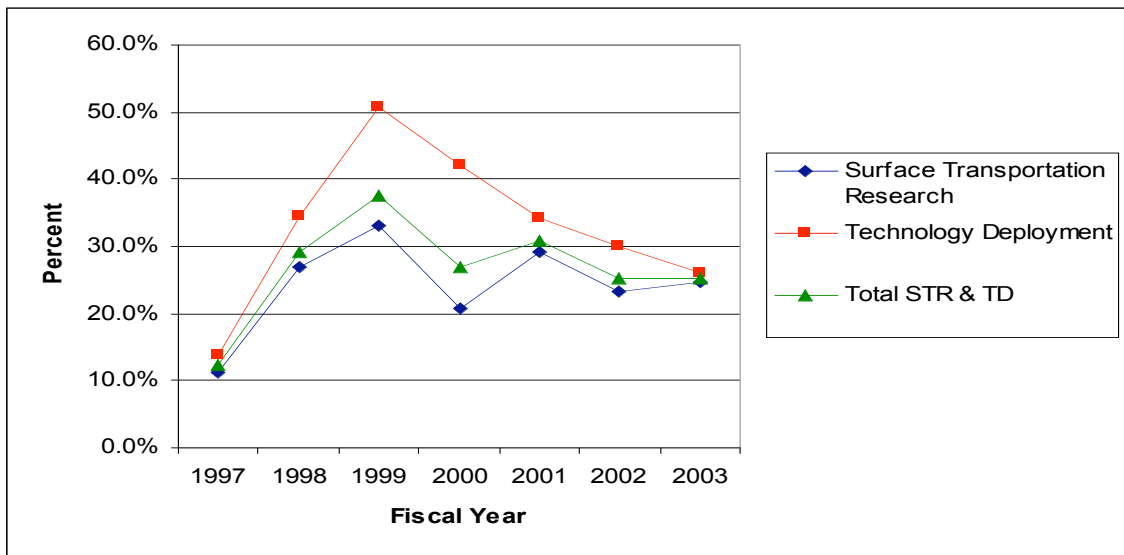


Figure 5: Earmarks as a Percent of FHWA's R&T program (with limitations applied)
Data source: FHWA budget table

5.3. Federal Transit Administration

The FTA R&T program presents a somewhat different picture from FHWA in that earmarking levels have been quite high for over a decade. Figure 6 shows research funding and earmarking from FY 1992 though FY 2002. The degree of earmarking ranges from about 40%

of the total research program to 90% in some years, leaving the agency with very little discretion in managing its R&T program.⁵

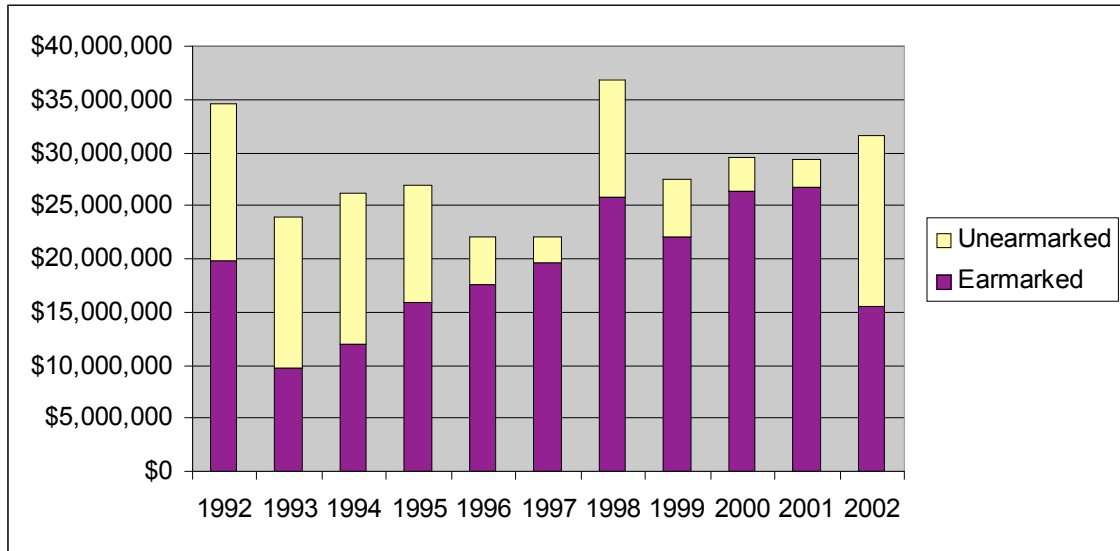


Figure 6: Earmarks as a Percent of FTA’s R&T program, FY 1992–FY 2002
Source: FTA

FTA’s earmarks contrast sharply with those in the FHWA program. While earmarks in highway research are almost entirely for research activities and are directed to universities, FTA earmarks display much more diversity in both activities funded and in recipients. Figure 7 shows the distribution of activities funded through earmarks in FTA’s research program from FY 1992 through FY 2004. During this period, 109 projects were earmarked, some receiving funding over multiple years. Relatively little earmarked funding (14%) has gone to research activities. Half of the funding has been directed to activities associated with testing or implementing new technologies. A remarkable number of projects funded by the FTA research program (33 out of the 109) have been planning studies for bus, rail, and other transit projects in particular locales, although these projects only represent 6% of earmarked funding. Similarly, community-oriented projects, such as programs to provide access to jobs or transportation for senior citizens,

⁵ Data in this section are derived from funding tables provided by FTA.

represent 7% of the earmarked funding. In the “other or uncertain” category there are earmarks that appear to fund purchase of equipment, construction of facilities, or operating expenses.⁶ The earmarking of research funds for projects that appear to contain few elements that can actually be considered research is one important way in which the earmarking of federal transportation research funds gives us reason to be concerned. So far, this has happened to a limited extent, but should this practice continue to grow it could directly threaten the viability of the transportation research enterprise.

Diversity of earmark recipients in the FY 1992 through FY 2004 period is shown in Figure 8. As might be expected from the relatively small amount of earmarked funds going to research, universities represent a relatively small percentage of earmark recipients (9%). On the other hand, local jurisdictions and transit authorities (and a few states) represent nearly half of earmark recipients. This reflects the fact that the planning studies are all earmarked to this type of recipient as well as many of the technology implementation projects and projects that appear to fund operations, equipment, or facilities. Private organizations, often industry associations or private research institutions,⁷ received about 30% of earmarked funding. Some of these earmarks are for research, a few are for training or standards development, and several are for development and testing of new technology. The “other or uncertain” category reflects projects where the type of recipient was not clear from the available information.

⁶ This categorization is based on the titles of the earmarks as provided by FTA.

⁷ It is assumed in Figure 8 that all the private sector earmark recipients are not-for-profit organizations, but this may not be the case.

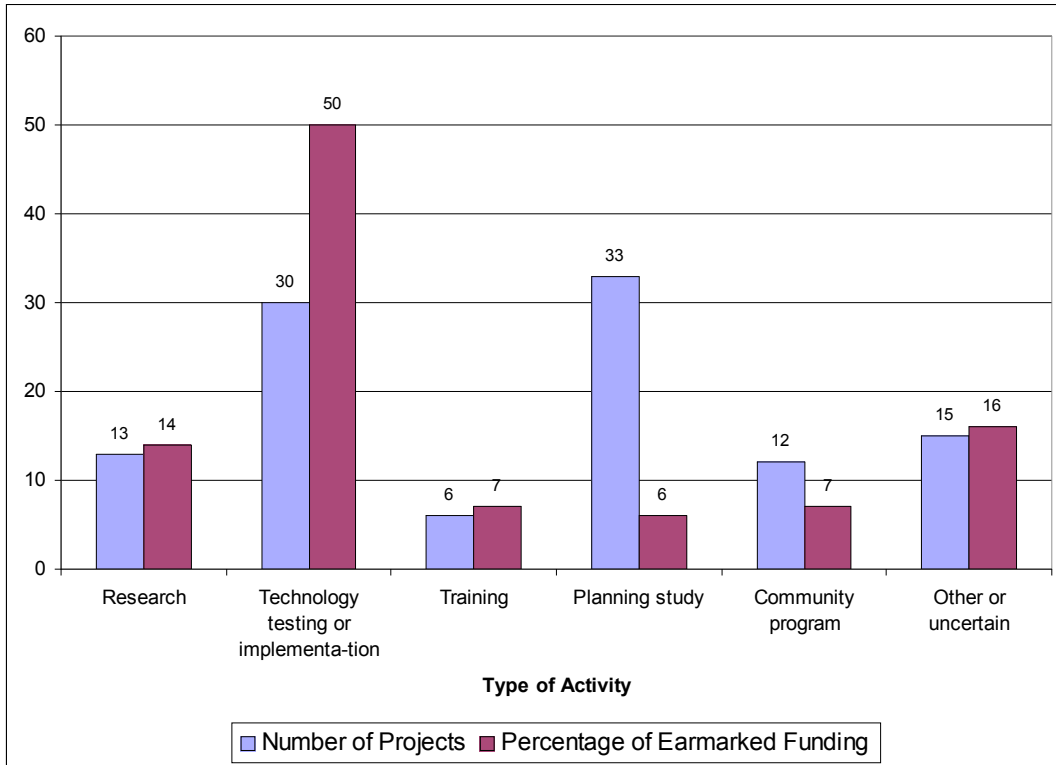


Figure 7: FTA Research Earmarks by Activity, FY 1992-FY 2004
 Data Source: FTA funding tables

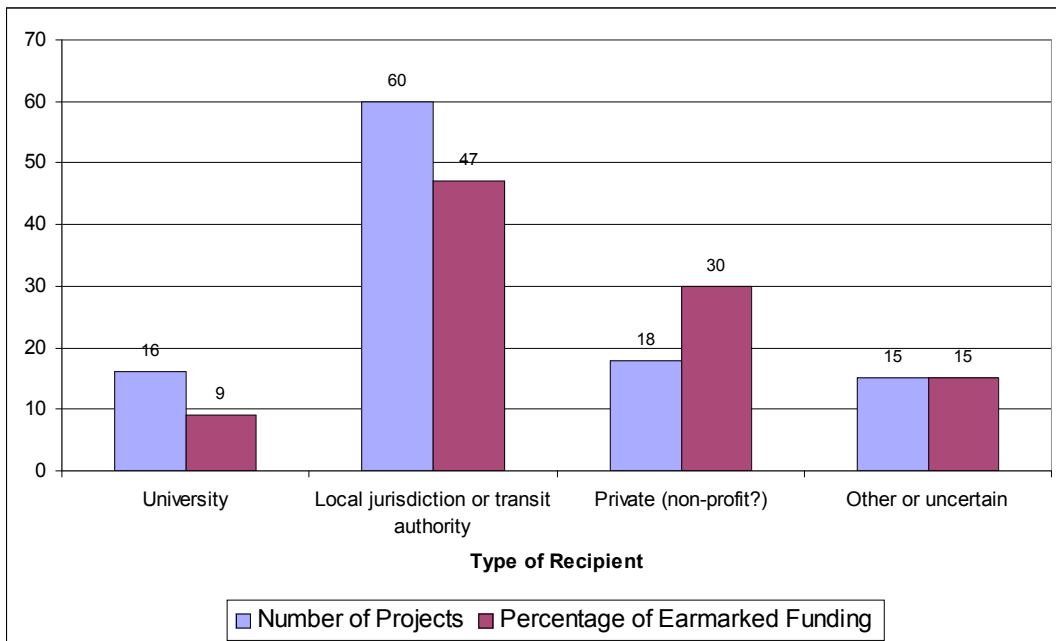


Figure 8: FTA Research Earmarks by Recipient, FY 1992-FY 2004
 Data source: FTA funding tables

The diversity reflected in FTA's earmarking highlights issues associated with managing mission-oriented research programs somewhat more than those associated with competitiveness. Whether such a wide variety of activities should be covered under a "research" program is a topic for another paper, but it does raise the question of how well an agency can pursue its research and innovation objectives if its R&T budget is used to cover other activities. Earmarks oriented toward specific studies or projects in particular jurisdictions, for example, have the potential to multiply much more rapidly than university earmarks (there are many fewer university transit research programs than cities in the United States and every city has a representative in Congress). In addition, some earmarks for development and testing of technologies from the private sector may raise questions about appropriate public and private roles in the market for innovations. But perhaps the most important issue raised by the FTA situation is how an agency can respond effectively to its mission-derived responsibilities when it has so little discretion in how it uses its R&T funding. The ability to respond to emerging opportunities, new threats such as post-September 11 security concerns, and evolving stakeholder needs is very much hampered.

5.4. Federal Aviation Administration

Prior to 1998, FAA's research program was not heavily earmarked. Starting in that year, however, earmarking rose significantly, from less than \$10 million per year to \$30 million or more (see Figure 9). Beginning in the mid-1990s, FAA's total research appropriation began to fall, so the increased earmarking represents an even greater impact on the program, rising from less than 5% to between 13% and 27%. Unlike FHWA, FAA must also pay the salaries of its research staff out of the research appropriation, which suggests that the impact on funds available for competitive research awards is even more significant.

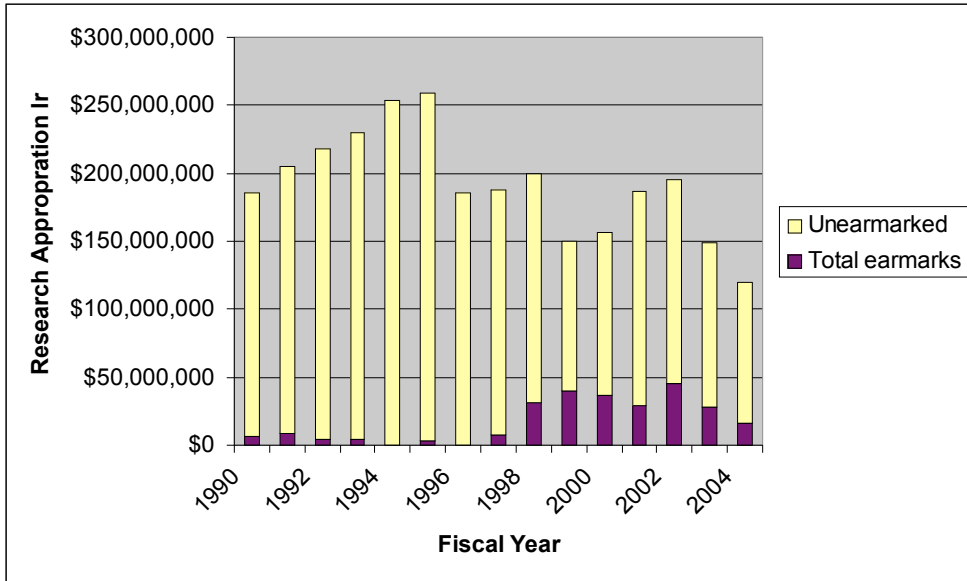


Figure 9: Earmarking in FAA’s Research Program
 Data source: FAA. 1991 data only include earmarks from House appropriations committee.

All FAA earmarks appear to be for research and technology development activities; however, the recipients of FAA earmarks are not necessarily universities. Between FY 1990 and FY 2004, there were 89 earmarks from FAA’s program. Of these, 25 (28%) went to universities. Six earmarks went to airports and one to a state DOT. The largest number of earmarks, 42 (47%), went to private labs, research centers, and consortia involving industry and other members. A significant class of earmark recipients is other federal entities: 15 earmarks (17%) were directed to federal agencies or federal laboratories. Figure 10 shows the amounts of earmarks to each type of recipient.

At times Congress specifies a research topic and funding amount while the intended recipient is not mentioned in the legislation or report language. In these cases, the intended recipient is made known to the FAA through discussions with appropriations committee staff. Since the agency feels it has no choice but to honor these communications, such designations are included as earmarks in this analysis. This practice seems to have begun in 1997; such earmarks

account for almost \$42 million or 18% of the earmarked funds since that year. They are included under private sector recipients in Figures 9 and 10.⁸

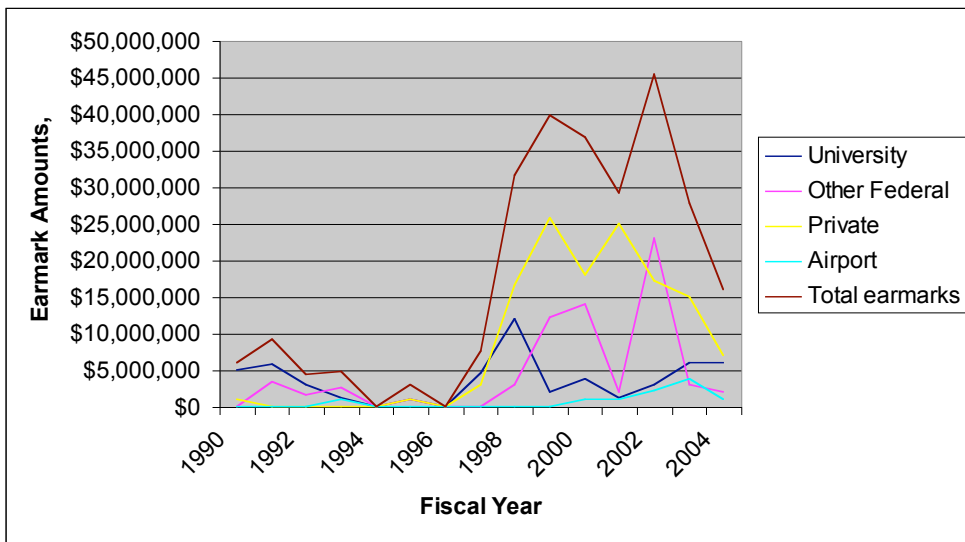


Figure 10: Recipients of FAA Earmarks
Data source: FAA. 1991 data only include earmarks from House appropriations committee.

5.5. Federal Railroad Administration

FRA’s research appropriations have seen a much lower level of earmarking than the FHWA and FTA programs. Figure 11 shows earmarked funds compared to total appropriations for FRA’s research program from FY 1991 through FY 2004. Over this period of time, earmarking usually represented less than 10% of the program, rising to 16% in FY 1992 and to 23% in FY 1996. There were 24 earmarked activities during this time, of which only three lasted more than a year. There were never more than four earmarks in any year. Most of the FRA earmarks appear to have been for research activities, often conducted by universities. Some earmarks appeared to be for planning or design studies. FRA staff indicated that occasionally Congress might provide additional money to cover an earmark, but this was not usually the case and additional money would still have to be offset somewhere in the agency’s budget.

⁸ Communication from FAA staff indicated that these “informal” earmarks are typically for private sector entities.

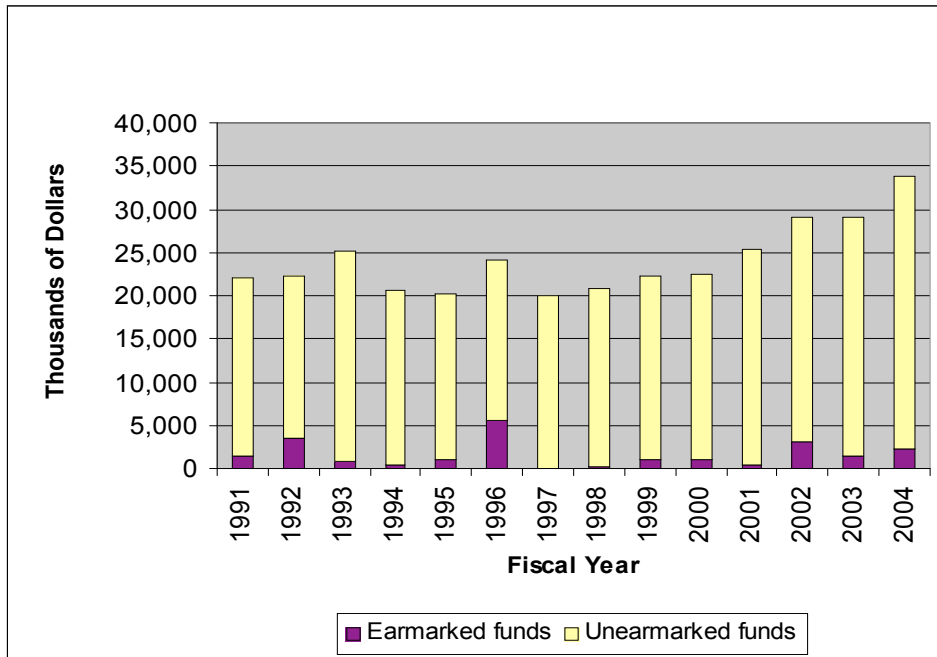


Figure 11: Earmarking in FRA’s Research Program
 Data Source: FRA funding table.

These data do not include the Next Generation High-Speed Rail, a program with annual funding of about \$4 million to \$5 million, which was entirely earmarked in FY 2003 and FY 2004.

5.6. University Transportation Centers

The University Transportation Centers (UTC)⁹ program is administered by the Research and Special Programs Administration of the USDOT. It is funded from three sources: the highway account of the Highway Trust Fund, the transit account of the Highway Trust Fund, and the General Fund. The highway account funding is authorized through FHWA’s research program and the transit account and General Fund resources are authorized through FTA’s research program.

As is evident from the program’s title, it is oriented entirely toward university transportation research. Figure 12 shows funding levels for competed and earmarked centers

⁹ During ISTEA, there was both a UTC program and a University Research Institute (URI) program. For the purposes of this paper, the URI program is included in the discussion of the UTC program.

from FY 1992 through FY 2003. Throughout this period, 10 centers have been competitively awarded every few years, one in each federal region of the country. These regional centers are consortia of several universities in the region with one university serving as the lead institution. The remainder of the funding provided for the UTC program is earmarked to individual universities or consortia. In the fourth year of TEA-21, 17 earmarked centers competed among themselves and 10 of these were awarded funding for the last two years of the authorization cycle; these account for the “semi-competitive” portion of the program shown in Figure 12 for FY 2002 and FY 2003. Reflecting growing concern about the future availability of a qualified transportation workforce, a principal rationale behind the UTC program is fostering the development of transportation professionals and researchers by funding transportation research activities at universities. This rationale accounts for the regional distribution of 10 centers, which ensures that transportation professional capacity building is fostered throughout the country. This rationale could also be used to justify earmarks to universities in areas with particular need for transportation professionals or with student populations traditionally underrepresented in transportation.

While the program was relatively small prior to the passage of TEA-21, few raised questions about the fact that nearly 50% of the program was earmarked. However, when the program grew by about 60% in TEA-21 and earmarking rose to 70% of the program—at the same time that university earmarks increased significantly in FHWA’s program—more attention was given to UTCs and higher expectations arose that they produce useful research and train future professionals. Reauthorization bills currently in Congress propose increases of nearly 70% (Senate) and more than 150% (House) in the UTC program with little expectation of reduced earmarking. If such funding increases occur, the pressure for earmarks to meet national

transportation needs is likely to increase. Current proposals include mechanisms to increase competition within the UTC program, ensure peer review of research performed at the centers, and require centers to demonstrate that their programs address national transportation goals.

6. The Risks of Earmarking Versus Research Competition

The driving forces of research earmarking discussed earlier represent potential benefits of the practice. From the perspective of research quality and research and innovation management, there are also a number of risks associated with the growth in earmarking. A great deal depends on the context within which the researchers operate, and different research problems are best handled in different ways. Still, it is possible to offer some general observations on the likely weaknesses of earmarking versus competition for research.

6.1. Earmarking May Push Universities' Energies in the Wrong Direction

An open competition of ideas encourages universities to focus their energies on preparing novel, cutting-edge, comprehensive, well-documented research proposals, and perhaps toward taking some risks by formulating new approaches. Because they know that they are engaged in a competition to be judged by qualified reviewers, those writing proposals strive to be thorough, careful, innovative, and persuasive. Earmarking, on the other hand, inherently directs energy toward lobbying and persuading legislators and their staff members, who can be very powerful but who may be marginally well-informed about the subject matter of the research.¹⁰ When seeking earmarks, presentations to elected officials tend to focus on the merits of the proposed geographic distribution of funds or on how many jobs might be created in a jurisdiction by an award rather than on the specific transportation problems to be solved, the rigor of the proposals

¹⁰ De Figueiredo and Silverman (2002) find that the return to investments in lobbying, in terms of earmarked funds received, are very high for universities represented by members of the House or Senate appropriations committees, while returns are close to zero for universities without such representation. This suggests that lobbying efforts are not as effective as simple political power.

to solve them, or the potential benefits of solving them. At its worst, the persuasion of legislators may consist of little more than campaign contributions and appeals to the loyalty of alumni who hold seats in Congress, while at its best it can often include rigorous arguments about the social purposes being served by the proposed research. Legislators sometimes argue that they are actually more qualified than specialist scientists or engineers to judge whether a particular research investment will benefit society. Because they are directly elected by citizens, they are more likely to put into context the value of a particular research study, while narrow technical experts who conduct peer reviews may not think about the broader consequences to society of the research to be undertaken. While this argument speaks to legislators' ability to judge the relevance to public policy of research topics, it does not address the question of researcher qualifications and research quality, which in competitive processes are judged by experts in the relevant field of study.

Energies devoted to writing research proposals, reviewing proposals of others and evaluating alternative research designs, and the examinations of the credentials of faculty members all contribute to the broadening of knowledge about the topics under discussion. They are among the mechanisms by which the state of the art is advanced; if we believe that we can collectively learn as a society, then these are the mechanisms of societal learning. Energies devoted to lobbying produce much smaller returns to the advancement of knowledge, though decisions made in response to lobbying for earmarks may certainly produce research programs that benefit society.¹¹

¹¹ Payne (2002) finds that earmarking is associated with increased number of published articles but decreased number of citations of per article, suggesting that earmarking may increase the quantity but decrease the quality of publications.

6.2. Earmarking May Undermine Respect for Science and Jeopardize Academic Freedom

The promise of objective scientific results—and the delivery of outstanding scientific and technical products of the U.S. research enterprise—have long given the academic world, a major contributor to U.S. science and technology, a privileged place in society. A particular manifestation of this privilege has been the government’s support for the system of peer review, which allows the scientific community to have an influence on the content of federal research programs and the allocation of research funds that is virtually unheard of in other federally-funded activities. Such influence is also quite rare in other countries.

By allowing the peer review process to be eroded through the practice of earmarking, universities are jeopardizing the place that science in general and universities in particular hold in society. This is an element of the “collective action problem” of earmarking described by Savage (1999). The collective benefits that researchers receive—in terms of federal research programs, the ability to participate in shaping these programs through the peer review process, the potential of receiving funding through competitive proposals, and the privileged place of science and research—are taken for granted when individuals succumb to the temptation to “free ride” on the system to gain their own benefits through earmarking. It is not surprising that, one-by-one, universities that opposed earmarking began accepting and even seeking earmarks in order to succeed in what is essentially a new form of competition, based now on political clout and effective lobbyists rather than on talented, hard-working researchers.

For now, the majority of federal research funds are still competitively awarded using some form of merit review. For this reason, those who benefit from earmarking may see no downside to the practice. In fact, many earmarked institutions also receive substantial competitively-awarded research grants and contracts. Yet they are riding on decades of

reputation and respect for science in American society. As research becomes increasingly and more explicitly politicized, this invisible foundation of cultural support may erode until scientists and the universities that employ them find themselves treated like any other interest group. Eventually, public support will ebb as politicization undermines respect for science and the inevitable decline in research quality begs the question of why public money should be expended so freely on this particular interest group. Universities will also see themselves increasingly required to pay the political piper—to “get out the vote” in return for earmarks, and eventually to produce the “right” research results for a political patron.

6.3. Earmarking Can Adversely Affect Mission-Oriented Research

The modal administrations of the USDOT have specific missions with respect to the nation’s transportation system. For example, the responsibilities of the FHWA pertain to “highway safety programs, research, and development related to highway design, construction and maintenance, traffic control devices, identification and surveillance of accident locations, and highway-related aspects of pedestrian safety.” [United States Code, Title 49, Section 104(c)(1)] Similarly, the other modal administrations are responsible for promoting safety in their modes of transportation, promulgating appropriate regulations in matters within their authority, carrying out relevant research, and other tasks specific to each administration (such as air traffic control in the Federal Aviation Administration). In each case, any research and development or technology transfer responsibilities possessed by a USDOT agency are directed toward the fulfillment of that agency’s particular operational mission. Especially since the passage of the Government Performance and Results Act (GPRA) in 1993, agency activities and

budgets are focused on achieving particular goals and their performance is measured by how well they do so. Research and technology activities are no exception to these requirements.

However, when a substantial portion of an agency's research budget is earmarked, the agency will have difficulty supporting its mission with research. If the level of earmarking comes to be particularly high, some of the mission support research may be neglected or delayed. At FHWA, the extent of earmarking became so great that the agency needed to seek relief from appropriators regarding the funding amounts designated to earmarked recipients so that basic laboratory functions at the agency's Turner-Fairbank Highway Research Center (TFHRC) would not have to be shut down.

In addition to matters of quality and scientific independence, which are relevant to all types of research, applied or mission-oriented research must be concerned with effectiveness and relevance. Not only must research be performed well so that the results are as accurate and reliable as possible, but also it must be focused on the right questions so that scarce research funding is strategically allocated to the most critical needs of a particular application or mission area. Because of the relevance requirement and the accountability of mission agencies to achieve certain outcomes, earmarking introduces another set of issues that are not adequately addressed through the practice of scientific peer review alone.

In contrast to grant-awarding agencies, such as NSF, mission agencies typically follow multi-year research and development plans involving several research contracts specifying certain research and technology deliverables. These contracts and deliverables must be coordinated to achieve mission objectives that transcend individual research projects. In addition to an agency's interest in securing the best talent for each element of the research plan, there is also a need to have the right elements addressed at the right time. It certainly can happen that an

earmark specifies the right work at the right moment, but more often earmarks are designated without regard for research plans. “Research and technology” for mission agencies encompasses a wide range of activities besides research per se. Prototype development, testing and evaluation, technology transfer, coordination, and information sharing all have a place in achieving an agency’s technological objectives. At times earmarks do not address the agency’s strategic priorities at all and may not even fall within the agency’s mission. For example, in TEA-21 there were earmarks for a trauma care center and for treatment of head injuries. While the USDOT does perform research in support of injury prevention, injury treatment is not part of its mission.

When a large percentage of an agency’s R&T budget is earmarked, few resources are left for these other tasks, which ensure the practical effectiveness of the research. While fine research may be conducted under earmarked programs, every dollar sidetracked from mission-focused needs weakens the agency’s ability to improve the functions and activities for which it is responsible. Under a zero sum budget, which is usually the case, such earmarks necessarily detract from mission-oriented research, regardless of the quality of the earmarked project.

6.4. Earmarking Reduces Accountability for Expenditure of Public Funds

Another concern is the relative lack of accountability associated with earmarked research. When an agency chooses a researcher competitively to do specified research, often under a contract requiring a specific deliverable rather than under a grant, non-performance can result in termination of the contract and redirection of funds to more responsive researchers. Agencies can also negotiate with researchers as needs change. Regardless of the contracting mechanisms used to deliver earmarked funds to a research institution, all the parties know that the funds will

be provided and maintained regardless of performance (barring truly egregious situations) because their source was a powerful politician, not a scientific or technical decision.

Potential lack of relevance and lack of accountability can be absorbed by most agencies if earmarking is only a small portion of the agency's research budget. When earmarking reaches double digits as a percentage of the research program and in some cases accounts for the majority of a research budget, an agency essentially loses its ability to perform research in support of its public responsibilities. Even when the earmarks are for very relevant research and the researchers are extremely responsive, agencies lose their ability to prioritize, manage, and respond to emerging needs and opportunities. A particularly striking example of this occurred after September 11, 2001. The terrorist attacks of that day made the need for improved transportation security quite evident. The FTA was interested in research on security of bus and transit systems, the need for which was underlined by subsequent attacks on a Madrid subway in March 2004. But the agency's research budget is habitually earmarked between 50% and 90% of its total, leaving little flexibility to dedicate a reliable amount to security research. Fortunately, the Transit Cooperative Research Program's governing committee agreed to allocate funds from its budget—ordinarily directed to applied research in support of bus systems and transit properties—to address this urgent need.

7. Conclusion

Earmarking of transportation research programs raises several issues that are relevant to the transportation research community and to transportation stakeholders in general. These issues include: quality of research, fairness and accountability in allocation of public funds, adequate support for investigator-driven research, agency ability to manage mission-oriented research and response to emerging needs and opportunities, responsiveness of research programs

to broad stakeholder interests, and recognition of the critical role of scientific research and technological development in transportation and in society in general. This paper lays out these issues in support of a dialogue among the members of the transportation community. It is hoped that the dialogue will lead to stronger and more effective transportation research programs at the federal level.

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