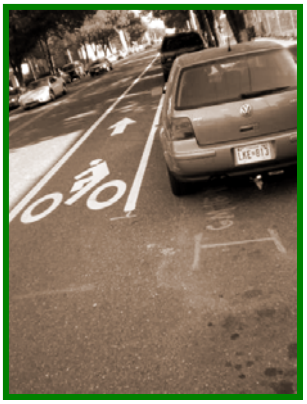

ESTIMATING THE EMPLOYMENT IMPACTS OF PEDESTRIAN, BICYCLE, AND ROAD INFRASTRUCTURE

CASE STUDY: BALTIMORE

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In this case study, we estimate the employment impacts of various transportation infrastructure projects in the city of Baltimore. We are particularly interested in examining the differences in employment resulting from different project types: those that focus on bicycle and pedestrian infrastructure and those that do not. Using an input-output model, we evaluate project-specific data provided by the City of Baltimore. We find that pedestrian and bicycle infrastructure projects create 11-14 jobs per $1 million of spending while road infrastructure projects create approximately 7 jobs per $1 million of expenditures. Below we describe the projects we analyzed and present more detailed estimates of the employment impacts.

Project Descriptions and Data

We acquired data from the City of Baltimore for a variety of completed infrastructure projects. Included in these are footway repair projects, bike lane projects, and road repair projects. The footway repairs included excavation and concrete removal, repairing and replacing concrete sidewalks, repairing and replacing drainage systems, planting trees, constructing pedestrian ramps, and laying brickwork. The bike lane projects included signing and marking for on-street bike lanes as well as a planned bike boulevard which will include signing and marking as well as curb extensions, bollards, and planters. Road repair projects fell into two categories: the more basic resurfacing jobs which entailed excavation, paving, and pavement marking; and the more elaborate road repair projects which also included more engineering work, drainage and erosion control, signage, and utility relocations.

For each project, the city provided us with expenditure data detailing the engineering, construction, and materials costs. We then used an input-output model to estimate the employment impacts resulting from these expenditures. For this case study, we used IMPLAN version 3.0 along with the 2008 Maryland data set for our analysis. The input-output (I-O) model allows us to assess the economy-wide impacts of various activities. In addition to the direct jobs that are created in the engineering and construction firms involved in infrastructure projects, jobs are created in the supply chain of these industries, which we call 'indirect jobs.' These indirect jobs are in industries such as cement manufacturing, sign manufacturing, and trucking. Furthermore, as workers in the direct and indirect industries spend their earnings, they create demand in industries such as food services and retail establishments, which we call the 'induced effects.' The I-O model captures not only the direct employment and output effects of an activity, but also the indirect and induced effects, and therefore provides a more complete picture of the impacts resulting from infrastructure spending.

Employment Impacts

Using the data provided by the City of Baltimore, we construct five infrastructure categories in our model: (1) footway repairs; (2) on-street bike lanes; (3) planned bike boulevard; (4) road repairs and upgrades; and (5) basic road resurfacing. For each category, we use IMPLAN to estimate the direct and indirect employment impacts. We then estimate the induced effects to be 38% of the combined direct plus indirect effects.[1] In the table below, we present the employment impacts resulting from spending $1 million on each of these infrastructure projects.

As we see from the table on the following page, $1 million in spending on pedestrian projects creates 11.3 jobs. Six of these jobs are directly created in the construction and engineering industries. An additional 2.2 jobs are indirectly created in industries such as concrete manufacturing and sign manufacturing. Further, 3.1 jobs in retail, healthcare, and food services are created through the induced effect. Thus a total of 11.3 jobs result from the initial $1 million pedestrian project. The employment multiplier in the rightmost column shows that for each job directly created

[1] In previous work, we assume that the national induced employment effects are equivalent to 40% of the combined direct and indirect effects (see the discussion in "Green Prosperity" by Pollin, Wicks-Lim, and Garrett-Peltier, available at www.peri.umass.edu). Here, we adjust the induced effect downward since local induced effects will tend to be smaller than national induced effects as residents of Maryland buy goods and services from out of state in addition to buying foreign imports. We use the local supply/demand ratio in IMPLAN to adjust the induced effect from 40% to 38% for this study.

EMPLOYMENT PER $1 MILLION EXPENDITURES					
	Direct jobs per $1 million	Indirect jobs per $1 million	Induced jobs per $1 million	**Total jobs per $1 million**	Employment multiplier
Pedestrian projects	6.0	2.2	3.1	**11.3**	1.9
Bike lanes (on-street)	7.9	2.5	4.0	**14.4**	1.8
Bike boulevard (planned)	6.1	2.4	3.2	**11.7**	1.9
Road repairs and upgrades	3.8	1.5	2.0	**7.4**	1.9
Road resurfacing	3.4	1.5	1.9	**6.8**	2.0

by a pedestrian project, an additional 0.9 jobs are created in the indirect and induced industries.

Of the five types of infrastructure projects analyzed in the City of Baltimore, we see that for a given level of spending, on-street bike lanes create the greatest number of jobs. Each $1 million spent creating on-street bike lanes directly creates 7.9 jobs and creates a total of 14.4 jobs when we include the indirect and induced effects. By comparison, pedestrian projects and bike boulevards create slightly fewer jobs: about 6 direct jobs and 11 total jobs for each $1 million spent. The two categories of road repairs have the lowest employment effects, with 3-4 direct jobs and approximately 7 total jobs created for each $1 million. Thus bike lanes, for a given level of spending, create about twice as many jobs as road construction.

Why do the employment impacts differ? Two major sources of variation in project costs cause these differences: labor intensity and the relationship between engineering and construction expenses. First, the labor intensity of the projects varies. That is, some projects are more labor-intensive; a greater proportion of the overall expenses are spent on labor versus materials. More labor-intensive projects will have greater employment impacts. Second, the ratio of engineering costs to construction costs varies across projects. Engineering is a more labor-intensive industry than construction, and therefore has a higher employment multiplier. Projects with higher engineering costs (as a share of total project expenses) will therefore have greater employment impacts than projects with a smaller share of engineering costs. These two sources explain the differences in our job estimates presented above. Projects such as footway repairs and bike lane signing and painting are labor intensive – they use a high ratio of labor to materials in comparison to projects such as road repairs, which spend a greater proportion of their total project budget on materials.

On the following page we present the top ten industries which experience employment gains as a result of spending on infrastructure construction. As we see from the table, for all projects, most jobs will be created in the construction industry. For bike projects, the second leading industry of job creation is architecture and engineering. For pedestrian and road projects, manufacturing industries such as stone, cement, plastic pipes, and wiring devices all see important job creation effects. In addition to the construction, engineering, and manufacturing industries, employment is also created in industries such as wholesale trade, truck transportation, food services, accounting, and legal services.

Investment in transportation infrastructure of all types will generate employment in various industries throughout Baltimore and the State of Maryland. In this case study we find that investments in bicycle and pedestrian infrastructure create the most employment for a given level of expenditure. While road construction projects create approximately 7 jobs per $1 million spending, pedestrian projects create over 11 jobs for the same level of spending, and bicycle projects create up to 14 jobs. Other studies have shown that investments in bicycle and pedestrian facilities can reduce carbon emissions and improve quality of life. Here we find that these investments bring an additional benefit to the community: they are an important source of job creation.

EMPLOYMENT IMPACTS: TOP TEN INDUSTRIES (DIRECT AND INDIRECT JOBS)					
	Footway repairs	**On-street bike lanes**	**Bike boulevard (planned)**	**Road repairs and upgrades**	**Road resurfacing**
1	Construction of other new nonresidential structures	Construction of other new nonresidential structures	Construction of other new nonresidential structures	Construction of other new nonresidential structures	Construction of other new nonresidential structures
2	Cut stone and stone product manufacturing	Architectural, engineering, and related services	Architectural, engineering, and related services	Plastics pipe and pipe fitting manufacturing	Wiring device manufacturing
3	Cement manufacturing	Employment services	Employment services	Ferrous metal foundries	Other concrete product manufacturing
4	Architectural, engineering, and related services	Food services and drinking places	Food services and drinking places	Cut stone and stone product manufacturing	Asphalt paving mixture and block manufacturing
5	Wholesale trade businesses	Real estate establishments	Wholesale trade businesses	Other concrete product manufacturing	Cut stone and stone product manufacturing
6	Employment services	Services to buildings and dwellings	Real estate establishments	Cement manufacturing	Greenhouse, nursery, and floriculture production
7	Services to buildings and dwellings	Wholesale trade businesses	Services to buildings and dwellings	Architectural, engineering, and related services	Sign manufacturing
8	Real estate establishments	Management, scientific, and technical consulting services	Accounting, tax preparation, bookkeeping, and payroll services	Asphalt paving mixture and block manufacturing	Cement manufacturing
9	Food services and drinking places	Accounting, tax preparation, bookkeeping, and payroll services	Management, scientific, and technical consulting services	Greenhouse, nursery, and floriculture production	Plastics pipe and pipe fitting manufacturing
10	Transport by truck	Legal services	Legal services	Sign manufacturing	Architectural, engineering, and related services