The Impact of the I-71/I-670 Interchange
Reconstruction Project on the Columbus MSA Economy

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Summary

The reconstruction of the I-71/I-670 interchange in downtown Columbus began in September 2011 and is scheduled for completion in 2014. This is a $200 million project and the first phase of the Columbus Crossroads project which will reconstruct the central city freeway system in order to reduce congestion and improve safety.

The project will also bring money into the regional economy and create and support jobs in all industry groups. (The region is defined as the eight-county Metropolitan Statistical Area – MSA – Delaware, Fairfield, Franklin, Licking, Madison, Morrow, Pickaway, and Union Counties.) The project will increase MSA output (gross domestic product) by $352.6 million and household and business earnings by $110.1 million over the three-year construction period. It will create or sustain an average of nearly 1,000 jobs over that period.

Tax revenues will also be increased as a result of the project. These revenues support government operations, reducing the need to fill these gaps by raising taxes. The state earns tax revenues of $5.3 million over the three-year project, while local governments earn $23.8 million.

There are additional long-run economic impacts that, while less able to be quantified, are no less real. These impacts include savings in travel time resulting from a more efficient interchange and reduction of property damages, injuries, and deaths from the interchange's improved safety.

The Nature and Measurement of Economic Impact

There are three primary activities involved in the project: the engineering work to design, manage, and assure the quality of the project; the construction of the interchange; and support activities including the maintenance of web pages and other information sources, public meetings to seek community input, and effort necessary to keep the public informed of progress and the availability of entrance and exit ramps as the project proceeds. The key focus of an economic impact assessment is the increase in output of the regional economy that results from the economic activity of a specific project – in this case, the construction, engineering, and support efforts involved in the reconstruction of the interchange. Output is measured by the value of goods and services produced in a given area over a given period of time; this is often referred to as Gross Domestic Product (GDP). A second consideration is the jobs that are created or sustained as a result of the project being undertaken.

The construction of the interchange creates economic impact through the purchases of goods and services and the payment of wages and salaries to employees working on the three components of the project. But these **direct** output and employment impacts are only part of the total impact. To the extent that these payments for purchases and wages and salaries are made to suppliers and employees within the MSA, the region's economic activity and output is increased further. The sales of local

suppliers increase, increasing output, and their employment may increase as well. The construction and workers and the employees of these firms' suppliers use the wages paid as a result of the increased output to make household purchases of all types. This creates further rounds of spending and output growth. It is important to emphasize that this additional spending would not have occurred had the construction project not been undertaken. For this reason, these **indirect** impacts are as much a part of the economic impact of the project as are the direct impacts.

These indirect output and employment impacts can be estimated by applying an economic impact model to the direct expenditures. Several generally-accepted models are available for this purpose; this analysis uses the Regional Input-Output Modeling System (RIMS-II), developed by the United States Bureau of Economic Analysis. As is the case for the other impact models, RIMS-II is based on a framework called an input-output table. For a given industry in a given geographical area, the input-output table shows the increase in purchases from other local firms by industry and the sales to other local firms by industry that result from a one dollar increase in the given industry's output. Thus, the input-output table can be used to derive the impact on other local firms of an increase in production within a specific industry.

These impacts are specific both to a given industry and to a given region. The mix of suppliers that benefit from a given construction project is generally the same regardless of location. But if the structure of the Columbus MSA economy is such that the Ohio Department of Transportation (ODOT) is forced to make most purchases from vendors outside the region, then most of the impact will leak from the local economy. Conversely, a broad local economy with many local suppliers will keep more of the impact of the output increase circulating within the local economy, and the impact of the project will be much greater. Thus, the values within the input-output table are unique to the Columbus MSA. The impact of this project is larger than it would otherwise be because ODOT selected a locally-based construction company and an engineering firm with a large local presence.

RIMS-II summarizes the information in the regional input-output table by calculating a set of unique impact factors for each of 490 detailed industries within the Columbus MSA. Because of their origin in the input-output table, the factors implicitly reflect the structure of the local economy and the presence or absence of local suppliers. One of these factors represents the total increase in regional output resulting from a one-dollar increase in output within a given industry. When this factor is multiplied by the increase in direct output, the result is the total regional increase in output; the indirect output impact is simply the difference between the total and direct impacts.

Other factors measure impacts on employment. One of these represents the total number of regional jobs sustained as a result of each $1 million of output within the specific industry.[1] Again, the indirect employment impact is the difference between total employment and direct employment (i.e., the construction, engineering, and project support workers).

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[1] Referring to the indirect jobs as "sustained" rather than "created" is a subtle, but important, distinction. The implication of the economic impact calculation is that the activity exists to support jobs in other industries. The model cannot determine whether the activity results in actual job creation or in existing employees working harder to accommodate the output increase.

Economic Impact of the I-71/I-670 Project

The reconstruction of the I-670/I-71 interchange is a $200 million project – $160 million in construction and $40 million in engineering and other project support services. But for two reasons, that does not imply that there is a $200 million direct impact on the Columbus MSA economy. First, economic output is valued on the basis of producer cost rather than final value. For many services, producer cost equals final value, but in cases where a good is produced – as in construction – producer cost is less than final value.   Second, some engineering work for this project is taking place outside of the region; the activity occurring elsewhere has no impact on the local economy.

Another modification is necessary to reflect the fact that this is a three-year project. A $160 million construction expenditure made over three years requires many fewer workers than it would if it were made over one year. It is assumed that expenditures are made evenly over the course of the project. As a result, the employment estimates are the average direct and indirect employment totals during the project's life. When the project is completed and the direct jobs end, so do the indirect jobs. (Actually, they gradually decline over time to zero.)

The estimated direct and indirect economic impacts are as follows:

	Construction	Engineering	Total
Expenditure ($000)	$ 160,000	$ 40,000	$ 200,000
Total output ($000)			
Direct	$ 129,328	$ 32,200	$ 161,528
Indirect	138,587	52,494	191,082
Total	$ 267,915	$ 84,694	$ 352,609
Total earnings ($000)			
Direct	$ 42,152	$ 8,661	$ 50,813
Indirect	45,170	14,070	59,240
Total	$ 87,322	$ 22,731	$ 110,053
Average employment			
Direct	386	68	454
Indirect	414	111	525
Total	800	179	979

Components may not add to totals because of rounding.

The table on the next page shows the distribution of average employment across the major sectors of the Columbus MSA economy. As noted earlier, some of the indirect jobs are sustained by existing employees working harder rather than new employees being hired. But even if this is the case, those employees are producing more output, so their jobs may be more secure.

Sector	Average jobs created/ sustained
Direct employment	
Construction	386
Professional, scientific, and technical services	68
Total direct	**454**
Indirect employment	
Agriculture, forestry, fishing, and hunting	1
Mining	1
Utilities	3
Construction	3
Manufacturing	37
Wholesale trade	19
Retail trade	87
Transportation and warehousing	21
Information	13
Finance and insurance	34
Real estate and rental and leasing	51
Professional, scientific, and technical services	49
Management of companies and enterprises	7
Administrative and waste management services	50
Educational services	9
Health care and social assistance	55
Arts, entertainment, and recreation	9
Accommodation	5
Food services and drinking places	40
Other services	25
Households	6
Total indirect	**525**
Total employment	**979**

Estimating State and Local Tax Revenues

The direct and indirect economic activity generated by the project will lead to increases in state and local tax revenues, including state and municipal income taxes, state and local sales taxes, local property taxes, and commercial activity taxes. These receipts support government operations, reducing the need to fill these gaps by raising taxes. Given information on the wages and salaries of the direct and indirect jobs, tax rates, and expenditure patterns, the amounts generated annually in most categories of these taxes can be estimated.

The first requirement is an estimate of total household earnings on which taxes are paid. Rather than the household earnings estimates generated by analysis of the RIMS-II multipliers, this study uses a more precise method of calculating aggregate earnings using the total employment in each direct and indirect industry sector and the average annual pay from the Bureau of Labor Statistics' Quarterly Census of Employment and Wages (QCEW, also known as ES-202 data). The direct employment totals

for each of the direct industries (highway, street, and bridge construction; engineering services; and communications services) and the indirect employment in each industry sector given above is multiplied by the average annual pay for that sector from QCEW and summed across sectors. This gives direct income of $96.6 million over the three years of the project, indirect income of $65.2 million, and total income of $161.8 million.

Income Taxes. The estimation of state income tax is complicated by the progressive state tax rate schedule. To address this, state tax liability is calculated and a tax rate determined for each direct and indirect industry sector at the average wage for the sector. In practice, Ohio adjusted gross income includes other sources of income as well, but it would be conceptually incorrect to include estimates of these (and other credits and deductions as well) because doing so would incorporate factors not relevant to the work on the interchange. Analysis of the Internal Revenue Service's *Statistics of Income* reveals that households claim an average of 1.98 exemptions, so two exemptions are assumed in the calculation. Half of returns are assumed to take the joint filing credit. Tax liability is divided by average income to give an effective tax rate for each industry sector. This is multiplied by the sector's aggregate income and the products summed across sectors to yield annual state income tax revenue, which is multiplied by three to give the project total: $2.8 million for the direct jobs and $1.4 million for the indirect jobs, for a total of $4.2 million.

Although municipal income taxes are levied on wage income at a flat rate, the complication here is that these rates vary significantly among jurisdictions. Generally, workers pay tax where they work regardless of where they live, although if the tax rate is higher in the municipality of residence than in the municipality of employment, the worker must pay the difference to the municipality where he/she lives. Townships are statutorily prohibited from charging income tax, so workers both working and living outside municipalities pay no tax at all.

To estimate municipal income tax revenues, an average tax rate is calculated for each county. This involves calculating the implied income on which each municipality's tax receipts is based and calculating a weighted average rate for the county. To reflect the portion of wages that are not taxed (and taxable income not reported), the sum of implied wages for the county is compared to the aggregate county income from QCEW.[2] A regional effective municipal tax rate is calculated by weighting the county rates by the county's share of regional aggregate income. The result is an effective rate of 1.88 percent.[3] This multiplied by sector aggregate incomes gives tax receipts of $2.1 million for the direct jobs, $1.2 million for the indirect jobs, and $3.3 million in total.

Sales Taxes. In order to estimate state and county sales and use taxes, it is necessary to estimate the share of household earnings that is spent on taxable consumption so that sales tax rates can be linked to income. Data from the Bureau of Labor Statistics' Consumer Expenditure Survey (CES) reveals that

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[2] In practice, the QCEW aggregate wage was less than the sum of implied income for most counties – likely reflecting timing differences between the earning of wages and the receipt of taxes – so the aggregate was multiplied by 0.85. This resulted in untaxed wages ranging from 3.0 percent of the total in Franklin County to 57.2 percent of the total in Delaware County.

[3] Taxes are calculated on the direct construction jobs at the Columbus rate of 2.25 percent.

households on average spend about 80 percent of their income on consumption. Analysis of detailed CES expenditure categories suggests that about one-third of these expenditures are on goods and services taxable in Ohio. The state tax rate is 5.5 percent; county rates vary from 0.75 percent in Fairfield to 1.5 percent in Licking, Morrow, and Pickaway. A weighted average rate is calculated based on the share of total regional households in each county; the result is an average rate of 1.25 percent. The state rate multiplied by the derived level of taxable expenditures gives state revenues of $1.4 million for the direct jobs and $946,000 for the indirect jobs, for a total of $2.3 million over the three years. The direct jobs yield $319,000 in local sales taxes and the indirect jobs yield $215,000, for a three-year total of $533,000.

Property Taxes. Residential property taxes are by far the largest source of local revenues. All workers pay these taxes regardless of whether they own or rent their home; renters pay taxes implicitly as part of their rent. The complications in estimating these receipts are that they are based on property value and not income, and that they vary widely among the hundreds of taxing jurisdictions in the MSA (130 in Franklin County alone). The 2002 American Housing Survey for the Columbus MSA gives a ratio of owner-occupied house value to income of 2.2.[4] House value is restated to 2009 using the Federal Housing Finance Agency's House Price Index, while income is restated using the growth of median Franklin County income from the American Community Survey. The net effect is that the house value to income ratio remains at 2.2. The Ohio Department of Taxation gives county average residential property tax rates before the 10 percent state rollback and the 2.5 percent rollback for owner-occupied housing. The net effective rate is calculated net of the owner-occupied rollback (2.5 percent times the percentage of households in each county that are owner-occupied from the American Community Survey). Because the 10 percent rollback is reimbursed by the state, it is an addition to local revenues and a deduction from state revenues. Local property taxes (including the rollback) are $11.8 million for the direct jobs, $8.0 million for the indirect jobs, and $19.8 million in total. Rollbacks for the taxes of direct employees are $1.3 million and those for indirect employees are $905,000, for a total transfer from the state to local governments of $2.3 million.

Business Taxes. The Commercial Activity Tax (CAT) is conceptually straightforward: 0.26 percent of gross receipts from most goods and services that are sold in Ohio. To estimate these revenues, the direct expenditures and indirect output estimates are each multiplied by 0.26 percent, yielding $520,000 and $497,000 respectively, for a total of $2.3 million. This estimate is understated in two respects. First, output estimates from RIMS-II are reported in producer prices rather than sales prices. Producer prices are equal to sale prices for most services, but can be far less than sale prices for goods. This yields to an understatement of indirect taxes. A potentially larger understatement comes from the fact that the output estimates include only the goods and services produced within the Columbus MSA; producers outside the region and state are also subject to the CAT on sales to Ohio consumers. Businesses, like consumers, are subject to sales and property taxes. The sales tax rate is the same for both businesses and consumers, while the property tax rate for commercial property is generally higher than for

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[4] A value-to-income ratio is not available for rented units. The 2.2 ratio may understate the ratio for renters because they may be renting in order to consume more housing than they can afford to buy. The net effect is that calculated property tax may be somewhat understated.

residential property (but may be abated). Household sales and property taxes were calculated by using purchase patterns and house value-to-income ratios to convert stated rates to rates based on income. No data are available that would allow an analogous calculation for business taxes, so these categories of tax are ignored. The implication is that actual tax revenues are likely higher than those estimated here.

Summary. The table below summarizes receipts from each category of state and local taxes discussed in the preceding sections. The state earns tax revenues of $5.3 million over the three-year project, while local governments earn $23.8 million. Again, these receipts are likely understated because they do not include business sales and property taxes.

	Direct	Indirect	Total
State revenues:			
Personal income taxes	$ 2,812,203	$ 1,413,590	$ 4,225,792
Sales taxes paid by households	1,402,622	946,362	2,348,984
Commercial activity taxes	520,000	496,812	1,016,812
Less property tax rollback reimbursement	(1,341,582)	(905,178)	(2,246,760)
Total state tax revenues	**$ 3,393,243**	**$ 1,951,586**	**$ 5,344,829**
Local revenues:			
Municipal income taxes	$ 2,122,646	$ 1,227,595	$ 3,350,241
Sales taxes paid by households	318,624	214,979	533,603
Property taxes paid by households*	11,862,131	8,003,494	19,865,625
Total local tax revenues	**$ 14,303,401**	**$ 9,446,068**	**$ 23,749,469**
Total state and local tax revenues	**$ 17,696,644**	**$ 11,397,654**	**$ 29,094,298**

*Includes the rollback reimbursement.
Components may not add to totals because of rounding.