

5.0 Economic Impacts

Using the methodology from Section 2.0 and the travel impacts from Section 4.0, this section presents the estimated economic impacts on the region and United States due to the completion of ADHS highway corridors. The direct effects are derived from travel-cost savings and market access impacts. These effects were run through the economic model in TREDIS to arrive at the total economic impact. The regional economic effects are presented in terms of:

Travel-Time and Cost Impact - Includes travel-time and travel distance impacts, which in turn also affect traveler fuel use, safety, cost of living, and business operating expenses. User benefits in this section of the report are narrowed to focus on those accruing to the ARC region based on origin-destination patterns, while full national-level user benefits are incorporated within the benefit/cost analysis.

Market Access Impact - Includes effects beyond the cost of travel, that affect the nature of freight delivery markets, logistics, labor markets and the business productivity of operating in alternative locations.

Total Economic Impact - Represents: 1) travel cost savings to industries; 2) market access impacts; and 3) spin-off economic activity from these effects, including multiplier effects. Total economic impacts are measured in terms of jobs, value added, and wages to the ARC region.

The impacts were generated for the “medium” (Global Insight) and “high” (Woods & Poole) growth scenarios to account for uncertainty in future population growth and travel demand. These scenarios are subsequently used to form ranges of likely benefits in the benefit/cost analysis. They also are provided for three regions of Appalachia: North, Central, and South.

5.1 DIRECT TIME AND COST TRAVEL IMPACTS

Direct travel impacts reflect savings to industry (both time and expense), time savings to households, and out-of-pocket household savings. However, the results indicate that large benefits accrue primarily to industry due to the magnitude of freight volume moving through the region, the high number of miles per trip, and the relatively high value of time for freight operations. Businesses are affected through reduced travel time for workers who are “on-the-clock” and for the value of freight which includes time reliability for deliveries. Households are affected through commuting and personal trips mostly by reduction in travel time. They may not have high “out-of-pocket” savings (e.g., gas costs) but they do show significant benefits from reduction in travel time. This savings in time is translated into monetary benefits based on their value of time.

These impacts phase-in gradually as highway construction projects are completed. After the construction completion, they are assumed to be growing at a constant rate until 2044; this is due to population and traffic levels growing over time. For purposes of this study, the year 2035 was chosen. By this time, the full impacts will have been phased in.

The total annual traveler savings for 2035 in the ARC region, seen in Table 5.1, range from \$3.1 to \$3.9 billion for the medium- and high-growth scenarios for the ARC region. These numbers do not include pass-through traffic – trips that do not start or end in the ARC region – which account for \$2 to \$2.1 billion in savings.

Table 5.1 ARC Traveler Cost Impacts in 2035

Cost Savings Category	Annual Travel Impact in 2035 (Millions 2007 Dollars)				
	North	Central	South	ARC Total	Rest of Nation
<i>Medium-Growth Scenario</i>					
Industry Savings	951	192	1,185	2,328	1,925
Household Cost Savings	8	2	13	22	1
Household Value-of-Time Benefit	261	58	419	737	38
Region Total	1,220	252	1,616	3,088	1,964
<i>High-Growth Scenario</i>					
Industry Savings	1,140	233	1,455	2,828	2,073
Household Cost Savings	15	3	24	42	2
Household Value-of-Time Benefit	371	83	596	1,050	55
Region Total	1,526	319	2,075	3,920	2,130

Source: Economic Development Research Group and Cambridge Systematics, Inc.

The benefit measures include the dollar value of all congestion-related travel time, travel expense and travel safety impacts that are averted by implementing the highway projects in Appalachia. These traveler impacts in turn affect *industry savings*, *household cost savings*, and *household value-of-time benefit*. When combined, these groups of benefits represent the measure of “transportation system efficiency” used in the benefit/cost analysis.

Industry Savings (\$2.3-\$2.8 Billion). Businesses save travel costs due to faster, more direct routes than would otherwise occur under current conditions. The benefits include reduced driver or traveler time spent en route, as well as reduced scheduling costs related to delivery time uncertainty.

Household Cost Savings (\$22-\$42 Million). Households save incurring the higher out-of-pocket travel expenses than would otherwise occur under previous conditions due to improved conditions. The benefits include lower vehicle operating expenses (fuel, etc.) and accident costs; this avoided cost represents

additional disposable income. In Appalachia, this is relatively small for households because most of their savings comes from driving times rather than distances.

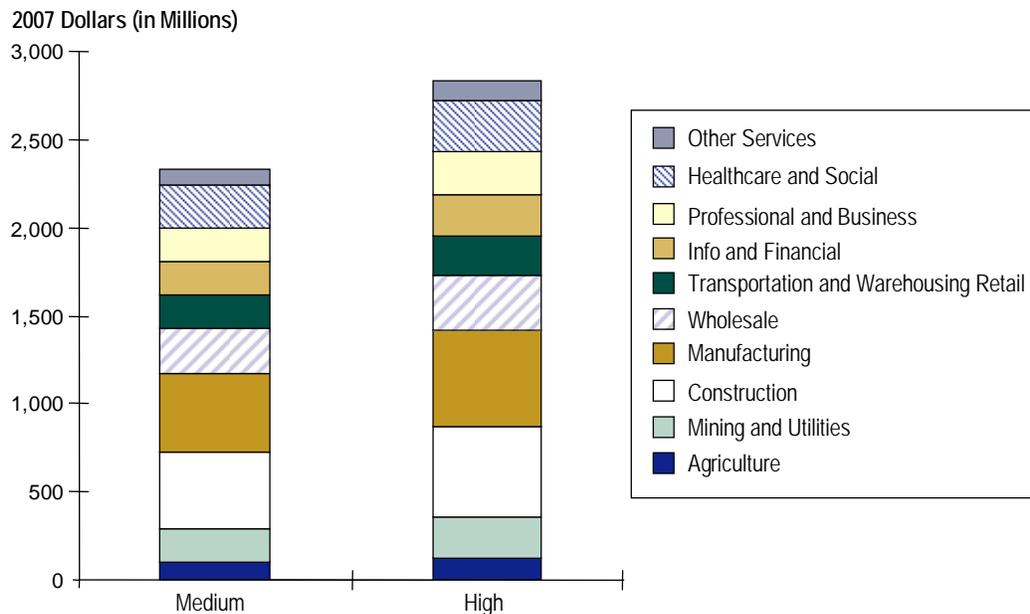
Household Value-of-Time (\$737-\$1,050 Million). Households receive a benefit in the form of time savings for personal travel (that is not business-related) from highway improvement. It should be noted that although household travel-time savings are a measurable (and real) benefit to the region, these benefits do not enter into the calculus of economic impacts, as they typically are not capitalized into any economic exchange. These benefits are included in the benefit/cost analysis.

Rest of Nation (Pass-Through) (\$1.96-\$2 Billion). These are generated from trips that go through the ARC region or those trips that either originate or terminate outside the region. This mostly affects longer truck routes who incur less travel costs due to faster routes. They are taken into account in the national benefit/cost analysis as they are benefits for the United States but not Appalachia.

The distribution of benefits is concentrated in the North and South regions in Appalachia, consistent with the number of counties, corridor projects, and economic size of those regions. Correspondingly, the Central region has 8 percent of the total user benefits.

Figure 5.1 shows the distribution of savings by industry for both the medium- and high-growth scenarios. The total magnitude of savings is higher for the high-growth scenario while the relative impact amongst industries is the same. Wholesale trade and manufacturing are the industries that receive the largest cost savings. These industries rely heavily on freight movement by truck. Service sectors such as healthcare and education, professional and business services, and retail trade also are highly affected; most likely due to the reduction in time for the commute of workers in these industries.

Figure 5.1 Distribution of Direct Business Cost Savings by Industries
Medium- and High-Growth Scenarios



Source: Economic Development Research Group.

5.2 MARKET ACCESS IMPACTS

In the previous section, travel-time and cost savings represented benefits to existing households and industries in the region. This section provides access benefits to the region which are mostly due to businesses relocating to the region – these are a benefit to Appalachia but not to the United States. However, market access impacts also include benefits from access improvements to existing businesses that are over and above the travel-cost savings – these are benefiting both the region and the United States.

Figure 5.2 shows the changes in access to markets for consumers and labor force and Figure 5.3 demonstrates reductions in travel time to the nearest commercial airport (see Appendix B for maps of other accessibility measures). While the market access changes to most counties were negligible, there were 50 counties (in the medium-growth scenario) with more than a 10 percent increase in access to labor and consumer markets, seen in the dark shaded counties in map. Beyond the impact on costs for existing travel, improved highway access can have an additional impact of on regional competitiveness for business attraction and expansion. The ease of access to delivery and labor markets are of the utmost importance to businesses deciding where to locate. Other transportation linkages are important and taken into account in the model, including: access to airport, marine port, intermodal rail facility, other international border.

Figure 5.2 Percentage Change in Population Accessible within a 60-Minute Drive in 2035
Labor and Consumer Markets

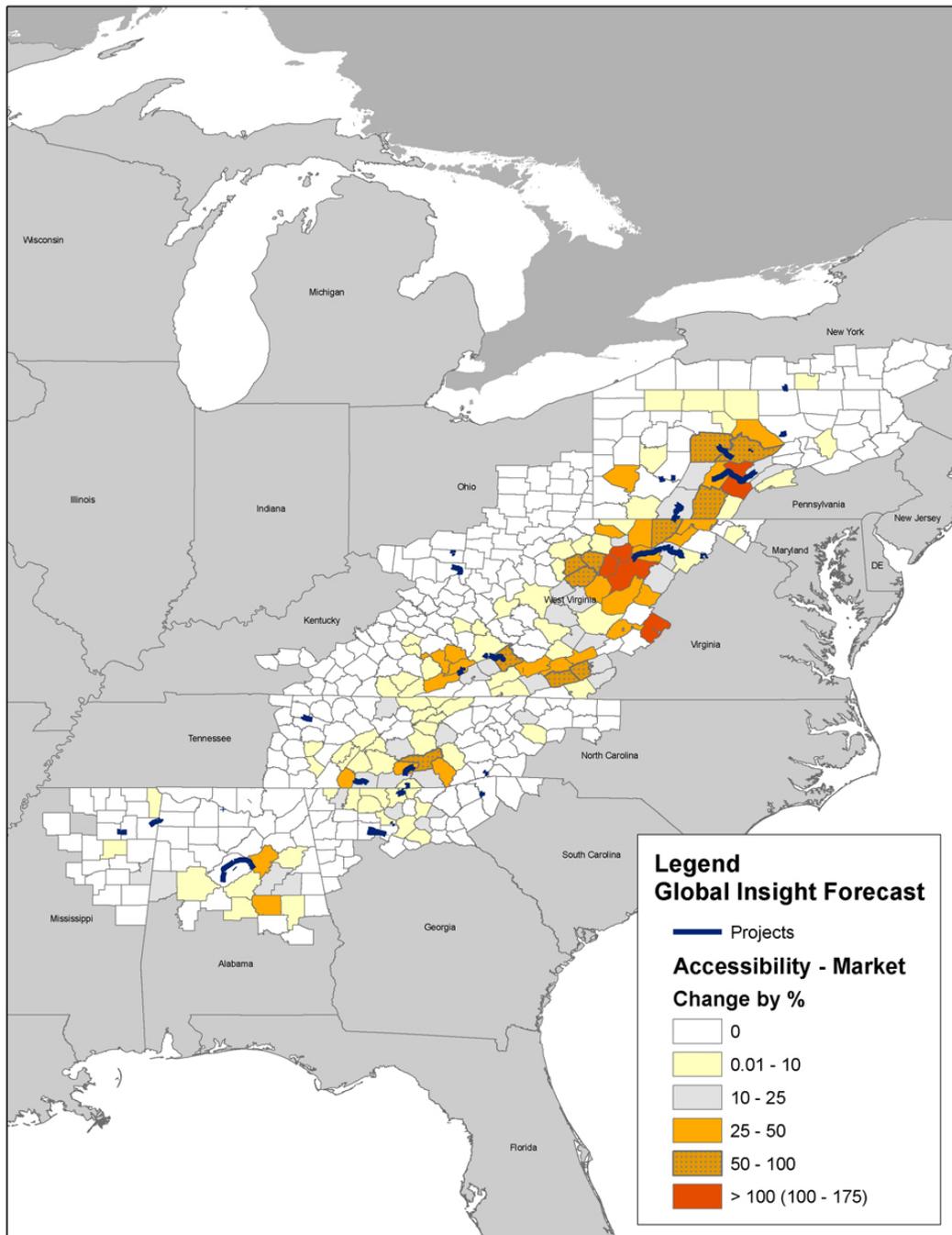
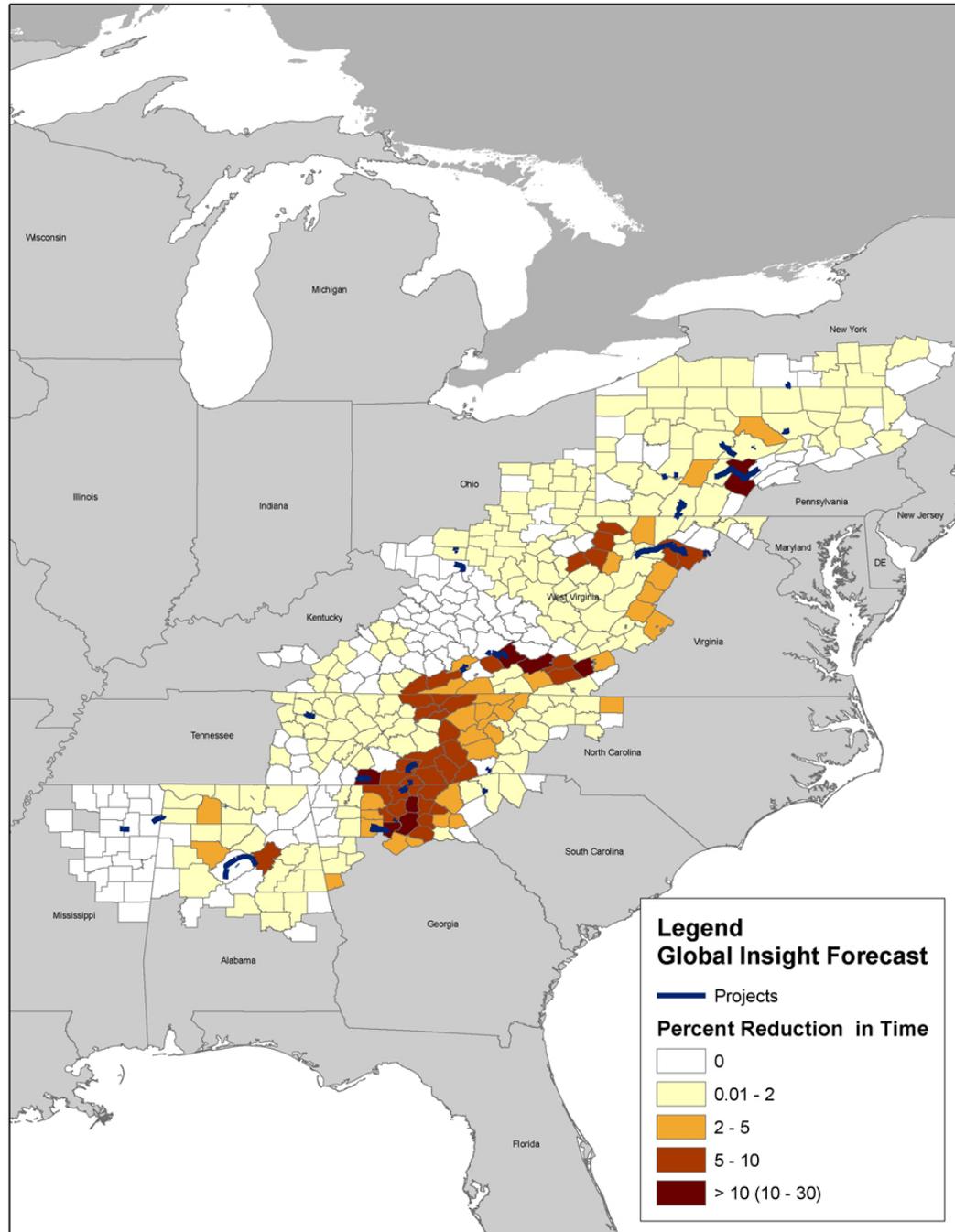


Figure 5.3 Percentage Reduction in Travel Time to Nearest Airport in 2035



The blue markings on the map indicate the location of new ADHS projects. As expected, most of the counties receiving a significant improvement in access lie near a highway project. When faced with difficulties in market access businesses can adjust their warehousing and logistics processes to stock more inventories, provide distribution from a larger number of locations, deploy more delivery

vehicles and drivers, or reduce guarantees for delivery times. All of these adjustments still involve increased costs or reduced revenue that go beyond the direct change in travel time and expense.

The market access impact for the ARC region includes the added activity from business that moves from outside Appalachia to within the region due to economies of scale associated with further market reach. Table 5.2 shows the projected direct business growth impact associated with improved access for Appalachia. This represents the net impact on new business investment in Appalachia. Business relocations within Appalachia are not counted. When viewed at the national level, the market access benefits associated with economic migration (relocations) cancel out, and only the *productivity* and *export* components of market access impacts remain. In all cases, the market access impacts are measured in terms of “value-added” economic activity (aka Gross Domestic/Regional Product), which represents the sum of worker income and business profit income generated in the region.

Table 5.2 Projected Market Access Growth in Appalachia for Medium and High Scenarios in 2035

		Annual Market Access Impact for 2035 (Value Added Millions 2007 Dollars)			
		North	Central	South	Total
Medium-Growth Scenario	Potential	1,127	145	1,242	2,513
	Probable	935	115	1,010	2,060
High-Growth Scenario	Potential	1,130	169	1,430	2,729
	Probable	940	137	1,193	2,270

Source: Economic Development Research Group, using the Local Economic Assessment Package (LEAP).

There are two scenarios for market access benefits – “potential” and “probable” – in addition to the medium and high estimates of underlying economic and population growth. The estimates for “probable” market access impact represent a more conservative estimate, as it assumes that the region successfully achieves some but not all of the “potential” opportunities. It is a more realistic assumption as it accounts for the likelihood that some of the region’s current constraints to economic competitiveness (such as workforce characteristics) may remain after the ADHS addresses the major access limitations.

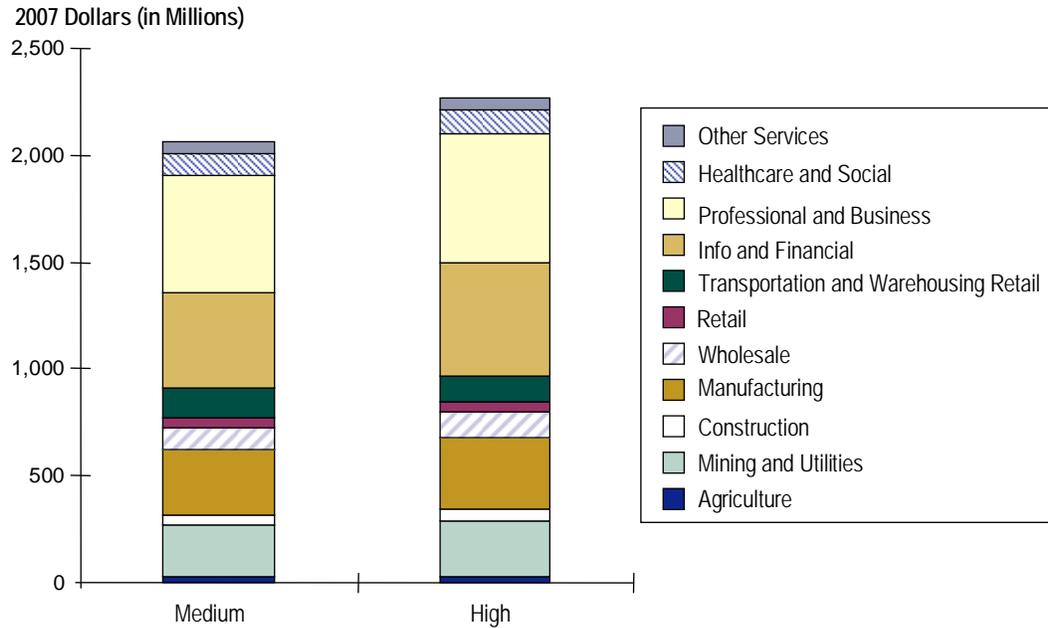
The market access impact of ADHS completion is estimated to yield business growth that will increase over time, rising to the range of \$2.1 to \$2.3 billion annually by the year 2035. As with the travel-cost savings, most of the impacts are expected to occur in the North and South parts of the ARC region. This reflects the location of the highway projects remaining to be completed, as well as the smaller size of population and employment base in the Central region.

Figure 5.4 shows a breakdown of market access impacts by industry, which are largely those dependent either on access to skilled labor (information, financial, and professional services) or delivery access (manufacturing) to broader national markets. These results are for the previously mentioned “probable” scenario for both medium and high growth. They are less evenly distributed than the results for travel-cost and time savings in the previous section. This is an indication of how much more important access to markets is to the select industries that show a large market access impact.

As previously noted, market access impacts consists of three elements: *exports*, *productivity*, and *relocation*. The analysis results in Figure 5.5 show the distribution of those impacts (applicable for both medium and high scenarios). The three elements of impact are defined as follows:

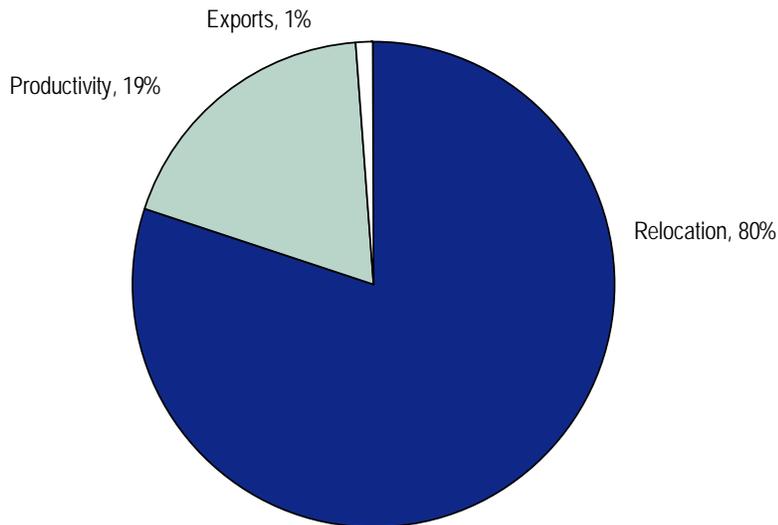
1. **Exports** - Impacts on business growth from exports arise due to improved access to airports, marine ports, and international borders. These represent benefits both to the region and to the U.S.
2. **Productivity** - Impacts on business productivity (output per unit of dollar input cost enabled by the logistics and scale economies in production and distribution systems that result from travel-time and reliability enhancement for isolated areas. They also may reflect access to a more diverse workforce and set of suppliers, which may reduce costs and increase quality of those inputs. This impact also is a benefit for the nation, as well as for the region.
3. **Relocation** - This category represents the bulk of the market access benefits. This occurs when access to markets is improved and businesses are more attracted to locate in the region. This affects businesses that rely on close proximity to labor, consumer and delivery markets. This represents a benefit to the region but not to the United States since it is assumed that business relocate from elsewhere in the United States.

Figure 5.4 Distribution of Market Access Benefits by Industries for “Probable” Scenario



Source: Economic Development Research Group, using the Local Economic Assessment Package (LEAP).

Figure 5.5 Components of Market Access Impact



5.3 TOTAL ECONOMIC IMPACTS

This analysis included the evaluation of regional economic growth impacts, reflecting the impacts of travel-cost savings as well as market access effects. The direct travel-cost savings accrue to existing (and projected future) trip patterns, while the market access effects enable new activities and trips that would not otherwise occur. Both increase economic competitiveness and hence lead directly to the expansion and attraction of additional business activity in the region. They also lead to “spin-off” activity through indirect effects (spending on suppliers) and induced effects (spending of worker income). All of these effects are calculated using the regional economic simulation and forecasting model in TREDIS. The following is a more detailed explanation of the components of the total economic impact which includes only those effects on Appalachia not on the United States.

Economic Impact of Travel-Time and Cost Savings – Business-related travel time and expense changes affect local cost of doing business, while household expense savings affect local cost of living. Changes in these cost savings end up shifting local spending patterns and prices, affecting local business activity and investment, and thus employment for some industries. The economic analysis system also recognizes that not all of these changes are absorbed in the local economy; some are passed on to customers outside of the region.

Changes in travel time for personal (non-business) trips have a value to society. However, they do not directly affect the flow of dollars in the economy, so their value is counted in the benefit/cost analysis but is not counted in the calculation of impact on the regional economy.

Economic Impact of Market Access Changes – Changes in access times also lead to effective changes in labor market and product delivery market areas, as well as access to intermodal transportation connections. These access changes end up shifting productivity and thus regional competitiveness for attracting various manufacturing, service, and office industries. Only the “probable” market access impacts were used which allowed for a more conservative impact.

Table 5.3 shows the economic benefit of implementing the new ADHS projects as opposed to current road conditions remaining in place. Therefore, it also could be construed as the loss to the region if the projects were not implemented. All numbers shown here reflect annual impacts as of the analysis year 2035. Benefits for earlier years will be smaller and benefits for later years will be even larger.

Table 5.3 Total Economic Impacts for Medium and High Scenarios in 2035

	Total Economic Impact for 2035 (Millions 2007 Dollars)			
	North	Central	South	Total
<i>Medium-Growth Scenario</i>				
<i>Economic Measure</i>				
Business Sales	4,165	555	5,382	10,102
Value-Added	2,129	264	2,602	4,995
Jobs	33,232	5,306	41,953	80,491
Wages	1,345	178	1,674	3,197
<i>High-Growth Scenario</i>				
Business Sales	4,433	667	6,429	11,529
Value-Added	2,251	317	3,112	5,679
Jobs	35,260	6,282	50,128	91,670
Wages	1,421	213	2,001	3,635

Source: Economic Development Research Group.

This table shows impacts on the regional economy, which can be measured in terms of total business sales, value-added, jobs, and wages. The impact on *business sales* is between \$10.1 and \$11.5 billion annually; this is not entirely felt in the region since the cost of intermediate inputs is included. The impact on *value-added*, the amount of revenue minus intermediate inputs, is between \$5 and \$5.7 billion. Arguably, the most important effect – *employment* – is increased in range of 80,491 to 91,670. In turn, these new jobs would generate between \$3.2 and \$3.6 billion in *wages* annually to Appalachia.

These total impacts were phased in gradually based on the time lag effects and growth rates that research implies for the completion of highway projects (see Section 2.5.1 for further description). Impacts are expected to be generated as soon as construction is completed and to be fully realized by 2035. The market access impacts were phased in based on the time lag effect and multiplier effects (indirect and induced) which were implemented based on a review of economic development literature and specific regional research conducted for this report (see Section 2.6.2 above). After 2035, the impacts grow at a constant rate based on assumed travel demand. Figure 5.6 shows the phase-in of total economic impact in terms of jobs in the entire ARC area for the medium-growth (Global Insight) and high-growth (Woods & Poole) scenarios.

Figure 5.6 Estimated Phase-In of the Economic Impact
Jobs

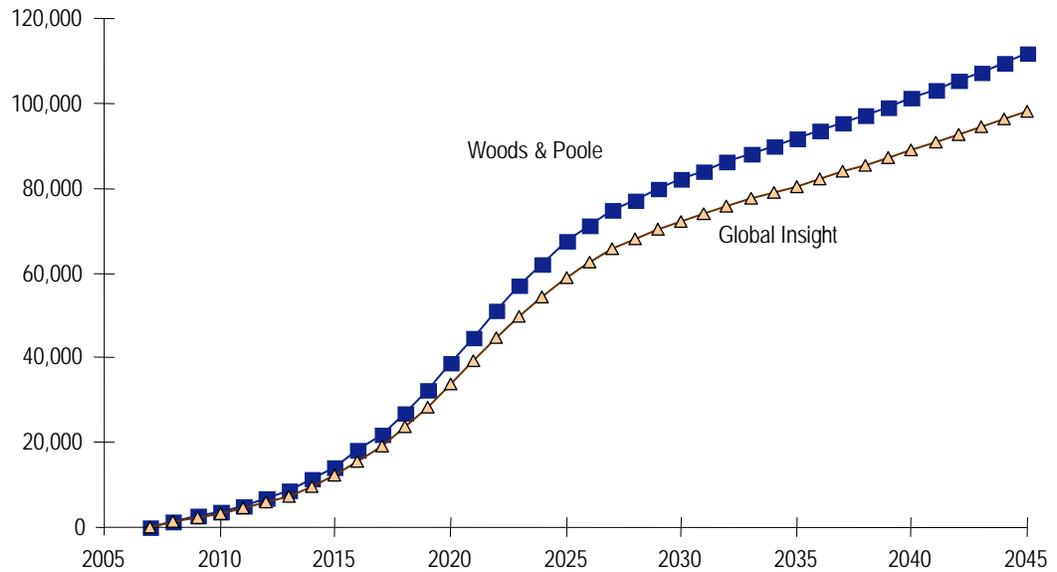


Figure 5.7 shows the breakdown of projected regional employment impacts by industry. That breakdown reflects a combination of the travel-cost incidence, the market access impact incidence, the response of affected industries to enhanced productivity and competitiveness, and the pattern of indirect (supplier) and induced (worker spending) effects.

Figure 5.7 Distribution of Employment Impacts
on the Region for Medium and High Scenarios

