The Potential Economic Benefits of Improving Literacy in the Permian Basin

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Executive Summary

- Currently, a significant proportion of people in Texas, New Mexico, and the Permian Basin have limited literacy skills. Not only does this issue negatively affect these individuals, but also workforce quality and, hence, economic growth potential.

- The percentages of the population with literacy skills at or above Level 3, meaning they are able to integrate information from relatively long or dense text or from documents, are significantly lower in all but one Permian Basin county than the state averages of 40% for Texas and 39% for New Mexico.

- The Perryman Group projected the total need for workers in the Permian Basin due to economic growth and replacement needs as people retire or otherwise leave occupations. The total need for workers in the region is forecast to be approximately
    - **98,300** between 2020 and 2030,
    - **106,900** for 2030-40, and
    - **114,700** over the 2040-50 decade.

- About **30%** of these positions will require Level 3 literacy.

- The fastest growing occupation in the decades to come which requires Level 3 literacy is truck drivers, followed by managers, software developers, and accountants and auditors. Many of these rapidly growing occupations support the area's energy sector, the cornerstone of the regional economy. Others are essential to the health and well-being of residents of the area.

- The Perryman Group segmented high-demand occupations that require Level 3 literacy and education/training beyond high school, but not a bachelor's degree. These occupations include the following:
    - Heavy and Tractor-Trailer Truck Drivers
    - Bookkeeping, Accounting, and Auditing Clerks
    - Automotive Service Technicians and Mechanics
    - Nursing Assistants
    - Teaching Assistants, Except Postsecondary
    - Medical Assistants
    - Hairdressers, Hairstylists, and Cosmetologists

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- Computer User Support Specialists
- Firefighters
- Geological and Hydrologic Technicians
- Licensed Practical and Licensed Vocational Nurses
- Heating, Air Conditioning, and Refrigeration Mechanics and Installers
- Paralegals and Legal Assistants
- Preschool Teachers, Except Special Education
- Dental Assistants
- Calibration Technologists and Technicians and Engineering Technologists and Technicians, Except Drafters, All Other
- Emergency Medical Technicians and Paramedics

- Without the needed growth in these occupations, potential expansion of key industries can be difficult. The area's energy sector, for example, relies on truck drivers, mechanics, technicians, and many other occupations with high demand in the decades to come. Similarly, the healthcare needs of the regional population can only be adequately met with the necessary nurses and nursing assistants, medical assistants, dental assistants, emergency medical technicians, and other workers with the skills (including Level 3 literacy) these jobs require. High-demand occupations also relate to public safety, education, construction, and other fields which enhance quality of life.

- An existing shortfall of some **8,765** workers with Level 3 literacy skills (as of 2020) is expected to increase by approximately 14,100 workers by 2030 for a total shortfall of **22,885**. The problem is expected to worsen over time if current patterns persist, reaching **36,971** in 2040 and **51,444** by 2050. Much of this increase is the result of the age composition of the current workforce.

- The Perryman Group estimated the economic cost of current shortfalls in workers with Level 3 literacy skills. When multiplier effects are considered, the current (2020) economic cost of this shortfall includes an estimated -**$111.7 million** in annual gross product and -**1,438** jobs across the Permian Basin. If current patterns persist, the cost of the shortage of workers with Level 3 literacy skills is projected to rise to -**$471.2 million** in annual gross product and -**6,067** jobs (including multiplier effects).

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- Improving literacy rates in the Permian Basin would enhance overall earnings as shortfalls in workers with the sufficient literacy skills were eliminated. When multiplier effects are considered, total economic benefits of the increased earnings include (as of 2040) an estimated
    - **$522.3 million** in annual gross product and **6,725** jobs if the region achieves literacy levels equal to Texas and New Mexico,
    - **$866.9 million** in annual gross product and **11,162** jobs if the region achieves literacy levels equal to the US rates, and
    - **$1.4 billion** in annual gross product and **18,609** jobs if literacy equaled the top five US states.

- Business activity generates tax revenue. The Perryman Group estimates that improving literacy rates can lead to a substantial increase in tax receipts including **$39.2-$108.4 million** to the State of Texas, **$18.1-$50.2 million** to the State of New Mexico, and **$28.8-$79.7 million** to local government entities across the region depending on the level of improvement attained.

- Enhancing literacy in the Permian Basin is a goal worthy of substantial support, with benefits for individuals, companies, the economy, and society as a whole. Indeed, it is essential to more fully achieving the enormous potential of this dynamic and strategically important region.

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Introduction

Literacy is essential to many daily activities, and its importance to quality of life can hardly be overstated. The Program for the International Assessment of Adult Competencies (PIAAC) defines literacy as "the ability to understand, evaluate, use and engage with written texts to participate in society, to achieve one's goals, and to develop one's knowledge and potential."

> Improving the literacy rate in the Permian Basin would not only enhance the quality of life and opportunities for those who are directly affected, but also increase productivity and, hence, economic activity.

Currently, a significant proportion of people in Texas, New Mexico, and the Permian Basin have limited literacy skills. Not only does this issue negatively affect these individuals, but also workforce quality and, hence, economic growth potential.
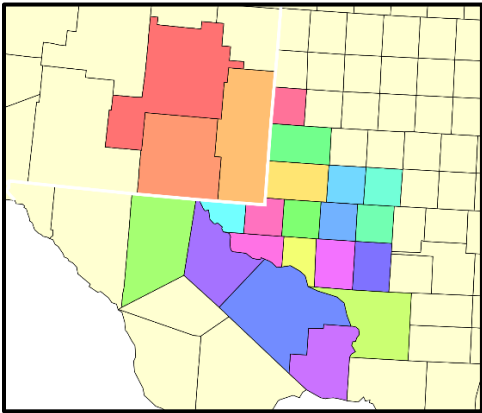
Improving the literacy rate in the Permian Basin would enhance the quality of life and opportunities for those who are directly affected, Productivity and economic activity could also be enhanced. Many jobs require proficiency in literacy and improving skills in this area will better position the region to meet future workforce needs. The adverse economic impact of current levels of illiteracy in the Permian Basin region of Texas and New Mexico is significant, and economic benefits of enhancing literacy in the region would be substantial.

The Perryman Group (TPG) was recently asked to evaluate the current and projected future shortfall of workers in the Permian Basin with literacy skills needed to meet labor needs as well as the associated economic costs. This analysis is part of a broader initiative designed to provide strategies to enhance adult literacy in the region.

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Current Permian Basin Literacy Levels

An estimated 28% of Texans and 29% of New Mexicans have very limited literacy skills (at or below Level 1 as defined by the PIACC[1]) according to the National Center for Education Statistics, and almost all of the 22 counties in the Permian Basin Region study area (depicted in the map below) have even higher rates of limited literacy. The percentages of the population with literacy skills at or above Level 3, meaning they are able to integrate information from relatively long or dense text or from documents, are significantly lower in all but one Permian Basin county than the state averages of 40% for Texas and 39% for New Mexico.

Permian Basin Literacy Skills by County
Percentage of the population with literacy skills at or above Level 3

Midland, TX	42%	Andrews, TX	25%	Terrell, TX*	34%
Ector, TX	29%	Martin, TX	34%	Crockett, TX	23%
Reeves, TX	17%	Gaines, TX	19%	Yoakum, TX	25%
Pecos, TX	17%	Howard, TX	31%	**State of TX**	**40%**
Loving, TX*	38%	Glasscock, TX*	38%	Eddy, NM	33%
Ward, TX	28%	Reagan, TX	22%	Lea, NM	25%
Winkler, TX	25%	Upton, TX	27%	Chaves, NM	32%
Culberson, TX	8%	Crane, TX	29%	**State of NM**	**39%**

Source: *Program for the International Assessment of Adult Competencies*, Institute of Education Services
Note: Interpret data for counties with small populations (denoted with an asterisk above) with caution due to potentially unstable predictor variables.

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[1] See Appendix B for a detailed description of literacy levels.

Clearly, there is a need for efforts to improve literacy in the Region given the high proportion of people with limited skills as well as the anticipated future demand for workers with higher literacy requirements.

Growth in the Need for Workers

Total demand for workers stems from both economic growth and the need to replace individuals who retire or leave occupations for other reasons. Estimating shortfalls of workers with necessary literacy levels involves the following major phases. First, economic growth by industry must be projected. Next, increases in employment by industry must be translated into the need for workers by occupation. In addition to the economic growth, there will be employees who retire or otherwise leave their jobs which will need to be replaced over time. These total demand estimates were then segmented by occupations which require Level 3 or greater literacy.

Employment Growth by Industry

Economic growth drives the need for additional workers. As an initial phase of this analysis, The Perryman Group utilized its US Multi-Regional Econometric Model to develop a detailed employment forecast for the study area.

The US Multi-Regional Econometric Model provides detailed industry-level projections and is used to provide ongoing forecasts for the various regions and metropolitan areas within the United States. It is formulated in an internally consistent manner and is designed to permit the integration of relevant global, national, state, and local factors into the projection process.

The model is the result of more than four decades of continuing research in econometrics, economic theory, statistical methods, key policy issues, and behavioral patterns, as well as intensive, ongoing study of all aspects of the global, US, state, metropolitan area, and county economies. It is extensively used by scores of federal and State governmental entities on an ongoing basis, as well as hundreds of major corporations. This model has been used to produce ongoing forecasts of Texas and its regions (including the Permian Basin) and metropolitan areas since the early 1980s and has been extended to include any county or multi-county area in the United States.

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The Permian Basin is expected to see substantial economic growth (though starting from a somewhat reduced level due to the effects of the pandemic, particularly on the oil and gas sector). As global demand for fuels increases as the impact of COVID-19 wanes, the energy sector is likely to see notable expansion which will drive increased activity across the regional economy.

The Perryman Group's forecasts indicate that total employment in the study area will expand from about 338,800 in 2020 to approximately 398,000 in 2030, 458,400 in 2040, and 519,400 in 2050. Additional detail is provided in the accompanying workbook.

Demand for Workers by Occupation

The next phase of the analysis is to translate projected growth in employment by industry into increases by occupation. The Perryman Group's US Multi-Regional Industry-Occupation System was used for this aspect of the assessment. The need for additional workers in hundreds of detailed occupations was quantified, with full results provided in the accompanying workbook.

The modeling process (which is described in further detail in Appendix C to this report) begins with the industry-occupation coefficients compiled by the Bureau of Labor Statistics of the US Department of Labor (BLS), with appropriate localization to the study area. These coefficients are based on extensive surveys of operating patterns in thousands of firms as well as secondary sources; they can be used to describe employment by occupation for any industry.

As noted, analysis of future workforce needs involves quantifying the number of workers required to replace individuals who relocate, retire, or leave their occupations for other reasons. Extensive surveys are used by BLS to develop replacement ratios by occupation. Using these ratios (with appropriate localization to the demographic patterns and job requirements within the Permian Basin) and the detailed forecast of employment for the area, The Perryman Group estimated additional workers needed due to replacement.

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The Perryman Group projects that the total need for workers (due to economic growth and replacement needs) in the Permian Basin Region will be approximately 98,300 between 2020 and 2030, 106,900 for 2030-40, and 114,700 over the 2040-50 decade.

Once the total demand for workers was quantified, demand for employees with literacy skills at or above Level 3, meaning they have the ability to integrate information from relatively long or dense text or from documents, was estimated. About 30% of these positions will require Level 3 literacy.

The total need for additional workers and demand for workers with Level 3 proficiency for major occupational groups are summarized in the following table.

Projected Demand for Permian Basin Workers with Level 3 Literacy Skills:
Major Occupational Categories

	2020-2030	2030-2040	2040-2050
TOTAL: All Jobs	**98,266**	**106,882**	**114,655**
Level 3			
TOTAL: Level 3 Jobs	**29,908**	**31,712**	**33,808**
Management	4,913	4,936	5,244
Business and Financial Operations	4,486	4,584	4,837
Transportation and Material Moving	3,854	4,539	5,109
Educational Instruction and Library	2,845	2,468	2,531
Healthcare Practitioners and Technical	2,434	2,730	2,889
Computer and Mathematical	2,231	2,091	2,182
Architecture and Engineering	1,730	1,900	1,992
Installation, Maintenance, and Repair	1,195	1,440	1,552
Healthcare Support	1,161	1,384	1,509
Life, Physical, and Social Science	1,127	1,117	1,166
Community and Social Service	935	962	1,014
Arts, Design, Entertainment, Sports, and Media	699	762	801
Office and Administrative Support	699	1,223	1,314
Legal	467	450	463
Personal Care and Service	410	416	452
Sales and Related	343	400	435
Protective Service	307	220	217
Production	41	55	62
Farming, Fishing, and Forestry	18	19	20
Food Preparation and Serving Related	13	16	19

Note: Demand from economic growth and replacement needs.
Source: The Perryman Group

Highest Demand Occupations

The Perryman Group's analysis indicates that the fastest growing occupation in the decades to come which requires Level 3 literacy is truck drivers, followed by managers, software developers, and accountants and auditors. Many of these rapidly growing occupations support the area's energy sector, the cornerstone of the regional

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economy. Others are essential to the health and well-being of residents of the area.

Permian Basin Occupations Requiring Level 3 Literacy Skills with the Highest Demand for Workers due to Growth and Replacement Needs			
	2020-2030	2030-2040	2040-2050
Heavy and Tractor-Trailer Truck Drivers	3,808	4,490	5,056
General and Operations Managers	1,924	2,042	2,180
Accountants and Auditors	941	1,009	1,063
Software Developers and Software Quality Assurance Analysts and Testers	846	629	661
Project Management Specialists and Business Operations Specialists, All Other	785	804	843
Registered Nurses	714	798	832
Bookkeeping, Accounting, and Auditing Clerks	645	1,093	1,176
Automotive Service Technicians and Mechanics	588	730	788
Petroleum Engineers	497	475	492
Financial Managers	486	393	413
Source: The Perryman Group			

Many of these occupations require specialized education such as bachelor's degrees or higher, but others are oriented to on-the-job or relatively shorter training programs.

High-Demand Occupations Not Requiring a Bachelor's (or Higher) Degree

Literacy is a crucial step in achieving a bachelor's or higher degree, but there are many other steps in that process. The Perryman Group segmented high-demand occupations that require education/training beyond high school, but not a bachelor's degree. This education/training may include an associate degree, some college, or a nondegree certification program.

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Projected Demand for Workers in the Permian Basin for Highest-Growth Occupations Requiring Level 3 Literacy Skills and Education/Training Beyond High School, but not Bachelor's (or Higher) Degrees

	2020-2030	2030-2040	2040-2050
Heavy and Tractor-Trailer Truck Drivers	3,808	4,490	5,056
Bookkeeping, Accounting, and Auditing Clerks	645	1,093	1,176
Automotive Service Technicians and Mechanics	588	730	788
Nursing Assistants	453	569	608
Teaching Assistants, Except Postsecondary	411	380	392
Medical Assistants	330	390	432
Hairdressers, Hairstylists, and Cosmetologists	258	265	287
Computer User Support Specialists	243	269	281
Firefighters	242	173	171
Geological and Hydrologic Technicians	204	201	215
Licensed Practical and Licensed Vocational Nurses	203	265	283
Heating, Air Conditioning, and Refrigeration Mechanics and Installers	175	248	276
Paralegals and Legal Assistants	148	156	164
Preschool Teachers, Except Special Education	143	171	187
Dental Assistants	121	179	200
Calibration Technologists and Technicians and Engineering Technologists and Technicians, Except Drafters, All Other	115	122	128
Emergency Medical Technicians and Paramedics	111	114	121

Note: Worker demand from economic growth and replacement needs.
Source: The Perryman Group

Without the needed growth in these occupations, potential expansion of key industries can be difficult. The area's energy sector, for example, relies on truck drivers, mechanics, technicians, and many other occupations with high demand in the decades to come. Similarly, the

healthcare needs of the regional population can only be adequately met with the necessary nurses and nursing assistants, medical assistants, dental assistants, emergency medical technicians, and other workers with the skills (including Level 3 literacy) these jobs require. High-demand occupations also relate to public safety, education, construction, and other fields which enhance quality of life.
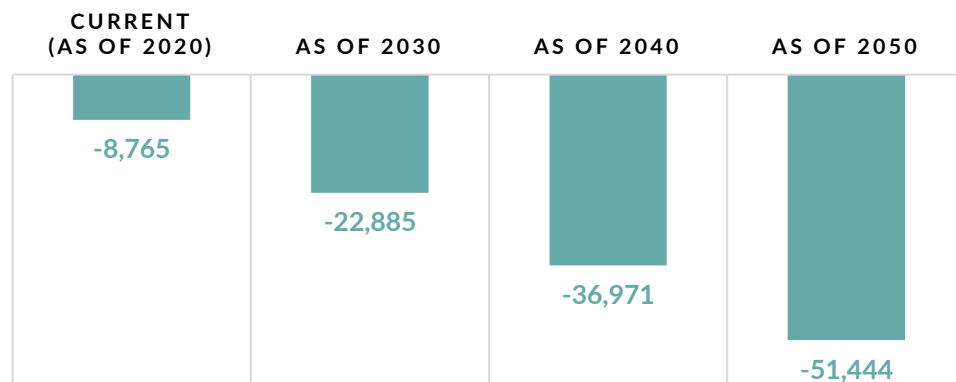
Projected Shortfall in Workers with Sufficient Literacy Skills

The Perryman Group quantified the likely shortfall in workers with Level 3 or higher literacy skills. These estimates are based on (1) projections from the Permian Basin submodel of the US Multi-Regional Econometric Model for employment and workforce participation rates and (2) a detailed occupational demand assessment from the US Multi-Regional Industry-Occupation System.

An existing shortfall of some **8,765** workers with Level 3 literacy skills (as of 2020) is expected to increase by approximately 14,100 workers by 2030 for a total shortfall of **22,885**. The problem is expected to worsen over time if current patterns persist, reaching **36,971** in 2040 and **51,444** by 2050. Much of this increase is the result of the age composition of the current workforce.

Given projected demographic and workforce participation patterns, it would be necessary to increase the Level 3 and above literacy rate for the region from the current 31.1% to about 37.7% over the course of the next generation (2020-2040) in order to meet projected needs.

Projected Permian Basin Shortfall in Workers with Level 3 Literacy Skills

CURRENT (AS OF 2020)	AS OF 2030	AS OF 2040	AS OF 2050
-8,765	-22,885	-36,971	-51,444

Source: US Multi-Regional Industry-Occupation System, US Multi-Regional Econometric Model, The Perryman Group

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These worker shortfalls curtail potential economic growth over time. In addition, they lead to reductions in overall earnings as the lack of skills inhibits the ability of residents of the region to obtain and perform such jobs which are often well paying. The Perryman Group estimates that the total direct lost earnings associated with the shortfall in workers with Level 3 skills totals approximately **$162.7 million** (as of 2020), with the potential to rise to a projected **$424.7 million** by 2030 and **$686.1 million** as of 2040.

Projected Permian Basin Shortfall in Workers with Level 3 Literacy Skills and Related Lost Earnings		
	Direct Worker Gap	**Lost Earnings** (millions of 2021 dollars)
2020	-8,765	-$162.654
2030	-22,885	-$424.676
2040	-36,971	-$686.087

Note: Based on The Perryman Group's estimates of the decreased earnings associated with shortfalls in the numbers of workers in the Permian Basin with Level 3 or above literacy skills. Definitions of the study area may be found on page 14 of this report.
Source: US Multi-Regional Industry-Occupation System, US Multi-Regional Econometric Model, The Perryman Group

These lost earnings reduce economic activity across the economy. Total economic effects of these losses are quantified in the following section.

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Economic Impacts of Worker Shortfalls

Any economic stimulus, whether positive or negative, leads to dynamic responses across the economy. The Perryman Group has developed complex and comprehensive models over the past four decades to measure these dynamic responses.

> Any economic stimulus, whether positive or negative, leads to dynamic responses across the economy.

In this instance, shortages of workers with the necessary literacy levels leads to lost earnings as described above. At the same time, improving literacy rates can have a positive effect on the regional economy.

Note that these estimates reflect only shortages in the numbers of potential workers with needed literacy levels. Additional shortfalls due to skills mismatches and a lack of needed education or training further increase the cost to the area of shortages in skilled workers. These estimates thus represent the minimum economic cost to the Permian Basin of workforce insufficiencies.

Methods used in this analysis are summarized on the following page, with additional detail in Appendix A. Results by industry are presented in Appendix B.

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Measuring Economic and Fiscal Impacts

Any economic stimulus, whether positive or negative, generates multiplier effects throughout the economy. In this instance, shortage of workers with requisite literacy skills leads to lost earnings and, hence, a reduction in economic activity. If literacy rates are improved, there would be economic benefits. Economic activity also generates tax receipts to the State and local governments through channels such as incremental retail sales and enhanced property values.

The Perryman Group's dynamic input-output assessment system (the US Multi-Regional Impact Assessment System, which is described in further detail in the Appendices to this report) was developed by the firm about 40 years ago and has been consistently maintained and updated since that time. The model has been used in hundreds of analyses for clients ranging from major corporations to government agencies and has been peer reviewed on multiple occasions. The impact system uses a variety of data (from surveys, industry information, and other sources) to describe the various goods and services (known as resources or inputs) required to produce another good/service. This process allows for estimation of the total economic impact (including multiplier effects) of the proposed development. The models used in the current analysis reflect the specific industrial composition and characteristics of the Permian Basin Region defined for purposes of this study to be the 22-county area comprised of Midland, Ector, Reeves, Pecos, Loving, Ward, Winkler, Culberson, Andrews, Martin, Gaines, Howard, Glasscock, Reagan, Upton, Crane, Terrell, Crockett, and Yoakum counties of Texas as well as Eddy, Lea, and Chaves counties of New Mexico.

Total economic effects are quantified for key measures of business activity (further explained in Appendix A):

- **Total expenditures** (or total spending) measure the dollars changing hands as a result of the economic stimulus.
- **Gross product** (or output) is production of goods and services that will come about in the area as a result of the activity. This measure is parallel to the gross domestic product numbers commonly reported by various media outlets and is a subset of total expenditures.
- **Personal income** is dollars that end up in the hands of people in the area; the vast majority of this aggregate derives from the earnings of employees, but payments such as interest and rents are also included.
- **Job gains** are expressed as job-years of employment for temporary stimuli such as construction and jobs for ongoing effects.

Monetary values were quantified on a constant (2021) basis to eliminate the effects of inflation. See Appendix A for additional information regarding the methods and assumptions used in this analysis.

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Economic Cost of Shortages of Workers with Level 3 Literacy Skills

The Perryman Group estimated the economic cost of current shortfalls in workers with Level 3 literacy skills. When multiplier effects are considered, the current (2020) economic cost of this shortfall includes an estimated -**$111.7 million** in annual gross product and -**1,438** jobs across the Permian Basin. If current patterns persist, the cost of the shortage of workers with Level 3 literacy skills is projected to rise to a projected -**$471.2 million** in annual gross product and -**6,067** jobs (including multiplier effects).

> If current patterns persist, the cost of the shortage of workers with Level 3 literacy skills is projected to rise to a projected -**$471.2 million** in annual gross product and -**6,067** jobs (including multiplier effects).

The Annual Impact of Earnings Losses Resulting from a Shortage of Skilled Workers Meeting Requisite Literacy Standards on Business Activity in the Permian Basin

	Total Expenditures (Millions of 2021 Dollars)	Gross Product (Millions of 2021 Dollars)	Personal Income (Millions of 2021 Dollars)	Employment (Jobs)
2020	-$226.402	-$111.703	-$69.666	-1,438
2030	-$591.118	-$291.646	-$181.891	-3,755
2040	-$954.982	-$471.170	-$293.855	-6,067

Note: Based on The Perryman Group's estimates of the decreased earnings associated with shortfalls in the numbers of workers in the Permian Basin with Level 3 literacy skills as well as related multiplier effects. Definitions of the study area and terms as well as an explanation of methods and assumptions used may be found on page 14 of this report and in Appendix A. Results by industry are included in Appendix C.
Source: US Multi-Regional Impact Assessment System, The Perryman Group

Economic costs are spread across the entire economy; results by industry are provided in Appendix B.

Benefits of Enhanced Literacy

As noted, improving literacy rates in the Permian Basin would enhance overall earnings as shortfalls in workers with the sufficient literacy skills

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were eliminated. The Perryman Group developed three scenarios to reflect potential benefits of successful initiatives to improve literacy measured as of 2040.

In the first scenario, it is assumed that the Permian Basin study improves literacy to reach the Texas and New Mexico statewide levels. Scenario 2 assumes the Permian Basin Region achieves adult literacy at a rate equal to the national average. The third scenario assumes the Permian Basin Region achieves adult literacy at a rate equal to the average of the highest five states.

> Enhancing literacy in the Permian Basin could lead to an estimated increase in direct earnings (as of 2040) ranging from nearly **$760.5 million** if the region achieves literacy levels equal to Texas and New Mexico to over **$2.1 billion** if literacy equaled the top five US states.

The increase in direct earnings as of 2040 under these scenarios is estimated to range from nearly **$760.5 million** if the region achieves literacy levels equal to Texas and New Mexico to over **$2.1 billion** if literacy equaled the top five US states.

Projected Permian Basin Direct Earnings Increases as of 2040 Associated with Enhancing Regional Literacy Levels	
	Increase in Direct Earnings (Millions of 2021 Dollars)
Scenario 1: Regional literacy equal to Texas and New Mexico levels	$760.468
Scenario 2: Regional literacy equal to US level	$1,262.343
Scenario 3: Regional literacy equal to top 5 US states	$2,104.473
Note: Based on The Perryman Group's estimates of the increase in earnings associated with improved literacy rates and the resulting enhancement of the regional workforce. Definitions of the study area and terms as well as an explanation of methods and assumptions used may be found on page 14 of this report and in Appendix A. Source: The Perryman Group	

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These direct improvements in earnings generate benefits across the economy; they were used as inputs to the impact assessment system to quantity the total potential benefits including multiplier effects.

When multiplier effects are considered, total economic benefits of the increased earnings include (as of 2040) an estimated

- **$522.3 million** in annual gross product and **6,725** jobs if the region achieves literacy levels equal to Texas and New Mexico,
- **$866.9 million** in annual gross product and **11,162** jobs if the region achieves literacy levels equal to the US rates, and
- **$1.4 billion** in annual gross product and **18,609** jobs if literacy equaled the top five US states.

Projected Annual Benefits as of 2040 of Earnings Increases Resulting from Enhanced Levels of Literacy on Business Activity in the Permian Basin				
	Total Expenditures (Millions of 2021 Dollars)	**Gross Product** (Millions of 2021 Dollars)	**Personal Income** (Millions of 2021 Dollars)	**Employment** (Jobs)
Scenario 1: Regional literacy equal to Texas and New Mexico levels	$1,058.515	$522.251	$325.713	6,725
Scenario 2: Regional literacy equal to US level	$1,757.089	$866.914	$540.669	11,162
Scenario 3: Regional literacy equal to top 5 US states	$2,929.271	$1,445.246	$901.359	18,609

Note: Based on The Perryman Group's estimates of the increase in earnings associated with improved literacy rates and the resulting enhancement of the regional workforce as well as related multiplier effects. Definitions of the study area and terms as well as an explanation of methods and assumptions used may be found on page 14 of this report and in Appendix A. Results by industry are included in Appendix C.
Source: US Multi-Regional Impact Assessment System, The Perryman Group

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Fiscal Effects

Business activity generates tax revenue. The negative economic effects of shortages in workers with Level 3 literacy reduce tax receipts. At the same time, incremental business activity associated with increased earnings that could occur if literacy is enhanced (as previously described) would lead to increases in tax receipts to the State and local government entities including counties, cities, schools, and special districts. Taxes are generated based on the increase in economic activity quantified by The Perryman Group and described in the preceding sections.

For example, the retail sales increase as a result of the economic stimulus measured in this study was quantified (results appear in Appendix C). A portion of these retail sales are taxable, leading to increased receipts to the State and local taxing entities. Economic benefits also affect property tax values. Higher incomes increase housing demand, leading to higher taxable values as well as additional need for houses. In addition, increased retail sales and incomes enhance the need for commercial space such as restaurants, retail outlets, and personal service facilities.

> The Perryman Group estimates that improving literacy rates can lead to a substantial increase in tax receipts including **$39.2-$108.4 million** to the State of Texas, **$18.1-$50.2 million** to the State of New Mexico, and **$28.8-$79.7 million** to local government entities across the region depending on the level of improvement attained.

Higher property values increase taxes to counties, cities, school districts, and other local taxing entities.

The Perryman Group estimates that shortages of workers in the Permian Basin study area with Level 3 literacy leads to losses in tax receipts (as of 2020) of -**$8.4 million** to the State of Texas, -**$3.9 million** to the State of New Mexico, and -**$6.2 million** to local government entities across the region. These losses are expected to grow substantially if current patterns persist, reaching approximately -**$49.2 million** to the State of Texas, -**$22.8 million** to the State of New

Mexico, and -**$36.2 million** to local government entities across the region by 2040.

Estimated Annual Fiscal Losses Due to Shortages in Workers with Level 3 Literacy Skills (in millions of 2021 dollars)			
	State of Texas	**State of New Mexico**	**Local Government Entities across the Permian Basin**
2020	-$8.377	-$3.877	-$6.161
2030	-$21.871	-$10.122	-$16.085
2040	-$35.334	-$16.353	-$25.985
2050	-$49.166	-$22.755	-$36.158

Note: Based on The Perryman Group's estimates of the negative fiscal effects associated with reduced economic activity due to shortages of workers with Level 3 literacy skills. Local government entities include cities, counties, school districts, and special districts. Definitions of the study area may be found on page 14 of this report and in Appendix A.
Source: US Multi-Regional Impact Assessment System, The Perryman Group

The Perryman Group estimates that improving literacy rates can lead to a substantial increase in tax receipts including **$39.2-$108.4 million** to the State of Texas, **$18.1-$50.2 million** to the State of New Mexico, and **$28.8-$79.7 million** to local government entities across the region depending on the level of improvement attained.

Projected 2040 Annual Fiscal Benefits of Improving Level 3 Literacy Skills (in millions of 2021 dollars)			
	State of Texas	**State of New Mexico**	**Local Government Entities Across the Permian Basin**
Scenario 1: Regional literacy equal to Texas and New Mexico levels	$39.165	$18.126	$28.803
Scenario 2: Regional literacy equal to US level	$65.012	$30.089	$47.811
Scenario 3: Regional literacy equal to top 5 US states	$108.382	$50.161	$79.707
Note: Based on The Perryman Group's estimates of the negative fiscal effects associated with reduced economic activity due to shortages of workers with Level 3 literacy skills. Local government entities include cities, counties, school districts, and special districts. Definitions of the study area may be found on page 14 of this report and in Appendix A. Source: US Multi-Regional Impact Assessment System, The Perryman Group			

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Conclusion

Improving literacy rates enhances the quality of life of those who benefit. Higher literacy and education have also been associated with a variety of other benefits such as greater opportunities for rewarding work, increased earnings, and a lower probability of unemployment.

Enhancing literacy in the Permian Basin is a goal worthy of substantial support, with benefits for individuals, companies, the economy, and society as a whole.

From an economic and societal perspective, improving literacy in the Permian Basin can lead to substantial incremental economic activity and tax receipts to Texas, New Mexico, and local government entities across the region. Even beyond these benefits, greater literacy and education are associated with a higher level of civic engagement, enhanced volunteerism, and many other positive outcomes.

Enhancing literacy in the Permian Basin is a goal worthy of substantial support, with benefits for individuals, companies, the economy, and society as a whole. Indeed, it is essential to more fully achieving the enormous potential of this dynamic and strategically important region.

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Appendix A: Methods Used

US Multi-Regional Impact Econometric Model

Overview

The US Multi-Regional Econometric Model was developed by Dr. M. Ray Perryman, President and CEO of The Perryman Group (TPG), about 40 years ago and has been consistently maintained, expanded, and updated since that time. It is formulated in an internally consistent manner and is designed to permit the integration of relevant global, national, state, and local factors into the projection process. It is the result of four decades of continuing research in econometrics, economic theory, statistical methods, and key policy issues and behavioral patterns, as well as intensive, ongoing study of all aspects of the global, US, state, and metropolitan area economies. It is extensively used by scores of federal and State governmental entities on an ongoing basis, as well as hundreds of major corporations. It can be integrated with The Perryman Group's other models and systems to provide dynamic projections.

This section describes the forecasting process in a comprehensive manner, focusing on both the modeling and the supplemental analysis. The overall methodology, while certainly not ensuring perfect foresight, permits an enormous body of relevant information to impact the economic outlook in a systematic manner.

Model Logic and Structure

The Model revolves around a core system which projects output (real and nominal), income (real and nominal), and employment by industry in a simultaneous manner. For purposes of illustration, it is useful to initially consider the employment functions. Essentially, employment within the system is a derived demand relationship obtained from a neo-Classical production function. The expressions are augmented to include dynamic temporal adjustments to changes in relative factor input costs, output and (implicitly) productivity, and technological progress over time. Thus, the typical equation includes output, the relative real cost of labor and capital, dynamic lag structures, and a technological adjustment parameter. The functional form is logarithmic, thus preserving the theoretical consistency with the neo-Classical formulation.

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The income segment of the model is divided into wage and non-wage components. The wage equations, like their employment counterparts, are individually estimated at the 3-digit North American Industry Classification System (NAICS) level of aggregation. Hence, income by place of work is measured for approximately 90 production categories. The wage equations measure real compensation, with the form of the variable structure differing between "basic" and "non-basic."

The basic industries, comprised primarily of the various components of Mining, Agriculture, and Manufacturing, are export-oriented, i.e., they bring external dollars into the area and form the core of the economy. The production of these sectors typically flows into national and international markets; hence, the labor markets are influenced by conditions in areas beyond the borders of the particular region. Thus, real (inflation-adjusted) wages in the basic industry are expressed as a function of the corresponding national rates, as well as measures of local labor market conditions (the reciprocal of the unemployment rate), dynamic adjustment parameters, and ongoing trends.

The "non-basic" sectors are somewhat different in nature, as the strength of their labor markets is linked to the health of the local export sectors. Consequently, wages in these industries are related to those in the basic segment of the economy. The relationship also includes the local labor market measures contained in the basic wage equations.

Note that compensation rates in the export or "basic" sectors provide a key element of the interaction of the regional economies with national and international market phenomena, while the "non-basic" or local industries are strongly impacted by area production levels. Given the wage and employment equations, multiplicative identities in each industry provide expressions for total compensation; these totals may then be aggregated to determine aggregate wage and salary income. Simple linkage equations are then estimated for the calculation of personal income by place of work.

The non-labor aspects of personal income are modeled at the regional level using straightforward empirical expressions relating to national performance, dynamic responses, and evolving temporal patterns. In some instances (such as dividends, rents, and others) national variables (for example, interest rates) directly enter the forecasting system. These factors have numerous other implicit linkages into the system resulting from their simultaneous interaction with other phenomena in national and international markets which are explicitly included in various expressions.

The output or gross area product expressions are also developed at the 3-digit NAICS level. Regional output for basic industries is linked to national performance in the relevant industries, local and national production in key related sectors, relative area and national labor costs in the industry, dynamic adjustment parameters, and ongoing changes in industrial interrelationships (driven by technological changes in production processes).

Output in the non-basic sectors is modeled as a function of basic production levels, output in related local support industries (if applicable), dynamic temporal adjustments, and ongoing patterns. The inter-industry linkages are obtained from the input-output (impact assessment) system which is part of the overall integrated modeling structure maintained by The Perryman Group. Note that the dominant component of the econometric system involves the simultaneous estimation and projection of output (real and nominal), income (real and nominal), and employment at a disaggregated industrial level. This process, of necessity, also produces projections of regional price deflators by industry. These values are affected by both national pricing patterns and local cost variations and permit changes in prices to impact other aspects of economic behavior. Income is converted from real to nominal terms using relevant Consumer Price Indices, which fluctuate in response to national pricing patterns and unique local phenomena.

Several other components of the model are critical to the forecasting process. The demographic module includes (1) a linkage equation between wage and salary (establishment) employment and household employment, (2) a labor force participation rate function, and (3) a complete population system with endogenous migration. Given household employment, labor force participation (which is a function of economic conditions and evolving patterns of worker preferences), and the working age population, the unemployment rate and level become identities.

The population system uses Census information, fertility rates, and life tables to determine the "natural" changes in population by age group. Migration, the most difficult segment of population dynamics to track, is estimated in relation to relative regional and extra-regional economic conditions over time. Because evolving economic conditions determine migration in the system, population changes are allowed to interact simultaneously with overall economic conditions. Through this process, migration is treated as endogenous to the system, thus allowing population to vary in accordance with relative business performance (particularly employment).

Real retail sales is related to income, interest rates, dynamic adjustments, and patterns in consumer behavior on a store group basis. It is expressed on an inflation-adjusted basis. Inflation at the state level relates to national patterns, indicators of relative economic conditions, and ongoing trends. As noted earlier, prices are endogenous to the system.

A final significant segment of the forecasting system relates to real estate absorption and activity. The short-term demand for various types of property is determined by underlying economic and demographic factors, with short-term adjustments to reflect the current status of the pertinent building cycle. In some instances, this portion of the forecast requires integration with the US Multi-Regional Industry-Occupation System which is maintained by The Perryman Group. This system also allows any employment simulation or forecast from the econometric model to be translated into a highly detailed occupational profile.

The overall US Multi-Regional Econometric Model contains numerous additional specifications, and individual expressions are modified to reflect alternative lag structures, empirical properties of the estimates, simulation requirements, and similar phenomena. Moreover, it is updated on an ongoing basis as new data releases become available. Nonetheless, the above synopsis offers a basic understanding of the overall structure and underlying logic of the system.

Model Simulation and Multi-Regional Structure

The initial phase of the simulation process is the execution of a standard non-linear algorithm for the state system and that of each of the individual sub-areas. The external assumptions are derived from scenarios developed through national and international models and extensive analysis by The Perryman Group.

Once the initial simulations are completed, they are merged into a single system with additive constraints and interregional flows. Using information on minimum regional requirements, import needs, export potential, and locations, it becomes possible to balance the various forecasts into a mathematically consistent set of results. This process is, in effect, a disciplining exercise with regard to the individual regional (including metropolitan and rural) systems. By compelling equilibrium across all regions and sectors, the algorithm ensures that the patterns in state activity are reasonable in light of smaller area dynamics and, conversely, that the regional outlooks are within plausible performance levels for the state as a whole.

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The iterative simulation process has the additional property of imposing a global convergence criterion across the entire multi-regional system, with balance being achieved simultaneously on both a sectoral and a geographic basis. This approach is particularly critical on non-linear dynamic systems, as independent simulations of individual systems often yield unstable, non-convergent outcomes.

It should be noted that the underlying data for the modeling and simulation process are frequently updated and revised by the various public and private entities compiling them. Whenever those modifications to the database occur, they bring corresponding changes to the structural parameter estimates of the various systems and the solutions to the simulation and forecasting system. The multi-regional version of the econometric model is re-estimated and simulated with each such data release, thus providing a constantly evolving and current assessment of state and local business activity.

The Final Forecast

The process described above is followed to produce an initial set of projections. Through the comprehensive multi-regional modeling and simulation process, a systematic analysis is generated which accounts for both historical patterns in economic performance and inter-relationships and best available information on the future course of pertinent external factors. While the best available techniques and data are employed in this effort, they are not capable of directly capturing "street sense," i.e., the contemporaneous and often non-quantifiable information that can materially affect economic outcomes. In order to provide a comprehensive approach to the prediction of business conditions, it is necessary to compile and assimilate extensive material regarding current events and factors both across the state of Texas and elsewhere.

This critical aspect of the forecasting methodology includes activities such as (1) daily review of hundreds of financial and business publications and electronic information sites; (2) review of major newspapers and online news sources in the state on a daily basis; (3) dozens of hours of direct telephone interviews with key business and political leaders in all parts of the state; (4) face-to-face discussions with representatives of major industry groups; and (5) frequent site visits to the various regions of the state. The insights arising from this "fact finding" are analyzed and evaluated for their effects on the likely course of the future activity.

Another vital information resource stems from the firm's ongoing interaction with key players in the international, domestic, and state economic scenes. Such activities include visiting with corporate groups on a regular basis and being

regularly involved in the policy process at all levels. The firm is also an active participant in many major corporate relocations, economic development initiatives, and regulatory proceedings.

Once organized, this information is carefully assessed and, when appropriate, independently verified. The impact on specific communities and sectors that is distinct from what is captured by the econometric system is then factored into the forecast analysis. For example, the opening or closing of a major facility, particularly in a relatively small area, can cause a sudden change in business performance that will not be accounted for by either a modeling system based on historical relationships or expected (primarily national and international) factors.

The final step in the forecasting process is the integration of this material into the results in a logical and mathematically consistent manner. In some instances, this task is accomplished through "constant adjustment factors" which augment relevant equations. In other cases, anticipated changes in industrial structure or regulatory parameters are initially simulated within the context of the Multi-Regional Impact Assessment System to estimate their ultimate effects by sector. Those findings are then factored into the simulation as constant adjustments on a distributed temporal basis. Once this scenario is formulated, the extended system is again balanced across regions and sectors through an iterative simulation algorithm analogous to that described in the preceding section.

US Multi-Regional Industry-Occupation System

The US Multi-Regional Industry-Occupation System translates detailed data on employment by industry (derived from the US Multi-Regional Econometric Model) into estimates of occupational categories at a highly detailed level. The modeling process begins with the industry-occupation coefficients compiled by the US Department of Labor based on extensive surveys of operating patterns in thousands of firms and other secondary sources. As an example, a typical tire plant of a given size requires machinists, mechanics, plant managers, administrative staff, custodial staff, shipping personnel, and numerous other types of workers. By compiling this information across the entire economy, a matrix is created which allows the data on employment by industry (which is regularly reported) to be translated into employment by occupation.

The US Multi-Regional Industry-Occupation System links this basic structure specifically to the economy of every metropolitan area, region, and county in the US, accounting for productivity and production patterns in each area. It is also regularly updated to reflect evolving patterns. The system can be fully integrated with historical employment data and the projections obtained from the US Multi-Regional Econometric Model. It can also be linked to results from the US Multi-Regional Impact Assessment System.

Thus, the industry-occupation system is a flexible mechanism to allow extensive evaluations of workforce characteristics and patterns. It is highly detailed, providing results for more than 1,000 occupational categories.

US Multi-Regional Impact Assessment System

Overview

The US Multi-Regional Impact Assessment System (USMRIAS) measures multiplier effects of economic stimuli. The USMRIAS was developed and is maintained by The Perryman Group. This model has been used in hundreds of diverse applications across the country and has an excellent reputation for accuracy and credibility; it has also been peer reviewed on multiple occasions and has been a key factor in major national and international policy simulations.

The basic modeling technique is known as dynamic input-output analysis, which essentially uses extensive survey data, industry information, and a variety of corroborative source materials to create a matrix describing the various goods and services (known as resources or inputs) required to produce one unit (a dollar's worth) of output for a given sector. Once the base information is compiled, it can be mathematically simulated to generate evaluations of the magnitude of successive rounds of activity involved in the overall production process.

There are two essential steps in conducting an input-output analysis once the system is operational. The first major endeavor is to accurately define the levels of direct activity to be evaluated. In this instance, The Perryman Group utilized detailed projections of economic growth by industry as input to the firm's US Multi-Regional Industry-Occupation System (previously described) to obtain estimated growth in employment by occupation. Levels of literacy required by occupations based on information compiled by the Bureau of Labor Statistics was then used to estimate the shortfalls in workers with the needed skills and the associated reduction in direct earnings.

The reductions in earnings were then used as inputs in a simulation of the input-output system to measure total overall economic effects of the direct stimulus. These amounts are fully adjusted to account for leakages from the local expenditure stream, such as taxes, savings, and out-of-area outlays. The system used reflects the unique industrial structure of the 22-county Permian Basin Region study area.

Model Structure

The USMRIAS is somewhat similar in format to the Input-Output Model of the United States which is maintained by the US Department of Commerce. The model developed by TPG, however, incorporates several important enhancements

and refinements. Specifically, the expanded system includes (1) comprehensive 500-sector coverage for any county, multi-county, or urban region; (2) calculation of both total expenditures and value-added by industry and region; (3) direct estimation of expenditures for multiple basic input choices (expenditures, output, income, or employment); (4) extensive parameter localization; (5) price adjustments for real and nominal assessments by sectors and areas; (6) comprehensive measurement of the induced impacts associated with payrolls and consumer spending; (7) embedded modules to estimate multi-sectoral direct spending effects; (8) estimation of retail spending activity by consumers; and (9) comprehensive linkage and integration capabilities with a wide variety of econometric, real estate, occupational, and fiscal impact models.

The impact assessment (input-output) process essentially estimates the amounts of all types of goods and services required to produce one unit (a dollar's worth) of a specific type of output. For purposes of illustrating the nature of the system, it is useful to think of inputs and outputs in dollar (rather than physical) terms. As an example, the construction of a new building will require specific dollar amounts of lumber, glass, concrete, hand tools, architectural services, interior design services, paint, plumbing, and numerous other elements. Each of these suppliers must, in turn, purchase additional dollar amounts of inputs. This process continues through multiple rounds of production, thus generating subsequent increments to business activity. The initial process of building the facility is known as the *direct effect*. The ensuing transactions in the output chain constitute the *indirect effect*.

Another pattern that arises in response to any direct economic activity comes from the payroll dollars received by employees at each stage of the production cycle. As workers are compensated, they use some of their income for taxes, savings, and purchases from external markets. A substantial portion, however, is spent locally on food, clothing, health care services, utilities, housing, recreation, and other items. Typical purchasing patterns in the relevant areas are obtained from the Center for Community and Economic Research *Cost of Living Index*, a privately compiled inter-regional measure which has been widely used for several decades, and the *Consumer Expenditure Survey* of the US Department of Labor. These initial outlays by area residents generate further secondary activity as local providers acquire inputs to meet this consumer demand. These consumer spending impacts are known as the *induced effect*. The USMRIAS is designed to provide realistic, yet conservative, estimates of these phenomena.

Sources for information used in this process include the Bureau of the Census, the Bureau of Labor Statistics, the Regional Economic Information System of the US Department of Commerce, and other public and private sources. The pricing data are compiled from the US Department of Labor and the US Department of

Commerce. The verification and testing procedures make use of extensive public and private sources.

Impacts are typically measured in constant dollars to eliminate the effects of inflation.

The USMRIAS is also integrated with a comprehensive fiscal model, which links the tax payments by industry to the specific rates and structures associated with the relevant State and local governmental authorities.

Measures of Business Activity

The USMRIAS generates estimates of total economic effects on several measures of business activity. Note that these are different ways of measuring the same impacts; they are not additive.

The most comprehensive measure of economic activity is **Total Expenditures**. This measure incorporates every dollar that changes hands in any transaction. For example, suppose a farmer sells wheat to a miller for $0.50; the miller then sells flour to a baker for $0.75; the baker, in turn, sells bread to a customer for $1.25. The Total Expenditures recorded in this instance would be $2.50, that is, $0.50 + $0.75 + $1.25. This measure is quite broad but is useful in that (1) it reflects the overall interplay of all industries in the economy, and (2) some key fiscal variables such as sales taxes are linked to aggregate spending.

A second measure of business activity is **Gross Product**. This indicator represents the regional equivalent of Gross Domestic Product, the most commonly reported statistic regarding national economic performance. In other words, the Gross Product of Texas is the amount of US output that is produced in that state; it is defined as the value of all final goods produced in a given region for a specific period of time. Stated differently, it captures the amount of value-added (gross area product) over intermediate goods and services at each stage of the production process, that is, it eliminates the double counting in the Total Expenditures concept. Using the example above, the Gross Product is $1.25 (the value of the bread) rather than $2.50. Alternatively, it may be viewed as the sum of the value-added by the farmer, $0.50; the miller, $0.25 ($0.75 - $0.50); and the baker, $0.50 ($1.25 - $0.75). The total value-added is, therefore, $1.25, which is equivalent to the final value of the bread. In many industries, the primary component of value-added is the wage and salary payments to employees.

The third gauge of economic activity used in this evaluation is **Personal Income**. As the name implies, Personal Income is simply the income received by

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individuals, whether in the form of wages, salaries, interest, dividends, proprietors' profits, or other sources. It may thus be viewed as the segment of overall impacts which flows directly to the citizenry.

The fourth measure, **Retail Sales**, represents the component of Total Expenditures which occurs in retail outlets (general merchandise stores, automobile dealers and service stations, building materials stores, food stores, drugstores, restaurants, and so forth). Retail Sales is a commonly used measure of consumer activity.

The final aggregates used are **Jobs and Job-Years,** which reflect the full-time equivalent jobs generated by an activity. For an economic stimulus expected to endure (such as the ongoing operations of a facility), the Jobs measure is used. It should be noted that, unlike the dollar values described above, Jobs is a "stock" rather than a "flow." In other words, if an area produces $1 million in output in 2019 and $1 million in 2020, it is appropriate to say that $2 million was achieved in the 2019-20 period. If the same area has 100 people working in 2019 and 100 in 2020, it only has 100 Jobs. When a flow of jobs is measured, such as in a construction project or a cumulative assessment over multiple years, it is appropriate to measure employment in Job-Years (a person working for a year, though it could be multiple individuals working for partial years). This concept is distinct from Jobs, which anticipates that the relevant positions will be maintained on a continuing basis.

Appendix B: Description of Literacy Levels

The Program for the International Assessment of Adult Competencies (PIAAC) is an international study for measuring, analyzing, and comparing adults' basic skills of literacy, numeracy, and digital problem solving developed by the Organization for Economic Cooperation and Development (OECD). Results are reported as averages on a 500-point scale which has been divided into five levels of proficiency. Proficiency refers to competence that involves "mastery" of a set of abilities along a continuum that ranges from simple to complex information-processing tasks.[2]

Description of PIAAC Literacy Proficiency Levels	
Proficiency Level and Score Range	**Task Descriptions**
Below Level 1 **0–175 points**	The tasks at this level require the respondent to read brief texts on familiar topics to locate a single piece of specific information. There is seldom any competing information in the text, and the requested information is identical in form to information in the question or directive. The respondent may be required to locate information in short continuous texts; however, in this case, the information can be located as if the text were noncontinuous in format. Only basic vocabulary knowledge is required, and the reader is not required to understand the structure of sentences or paragraphs or make use of other text features. Tasks below Level 1 do not make use of any features specific to digital texts.
Level 1 **176–225 points**	Most of the tasks at this level require the respondent to read relatively short continuous, noncontinuous, or mixed texts in digital or print format to locate a single piece of information that is identical to or synonymous with the information given in the question or directive. Some tasks, such as those involving noncontinuous texts, may require the respondent to enter personal information into a document. Little, if any, competing information is present. Some tasks may require simply cycling through more than one piece of information. The respondent is expected to have knowledge and skill in recognizing basic vocabulary, determining the meaning of sentences, and reading paragraphs of text.

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[2] Additional information is available from the US Department of Education Institute of Education Sciences and National Center for Education Statistics; see
https://nces.ed.gov/surveys/piaac/index.asp.

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Description of PIAAC Literacy Proficiency Levels

Proficiency Level and Score Range	Task Descriptions
Level 2 **226–275 points**	At this level, texts may be presented in a digital or print medium and may comprise continuous, noncontinuous, or mixed types. Tasks at this level require respondents to make matches between the text and information and may require paraphrasing or low-level inferences. Some competing pieces of information may be present. Some tasks require the respondent to cycle through or integrate two or more pieces of information based on criteria; compare and contrast or reason about information requested in the question; or navigate within digital texts to access and identify information from various parts of a document.
Level 3 **276–325 points**	Texts at this level are often dense or lengthy and include continuous, noncontinuous, mixed, or multiple pages of text. Understanding text and rhetorical structures becomes more central to successfully completing tasks, especially navigating complex digital texts. Tasks require the respondent to identify, interpret, or evaluate one or more pieces of information and often require varying levels of inference. Many tasks require the respondent to construct meaning across larger chunks of text or perform multi-step operations in order to identify and formulate responses. Often, tasks also demand that the respondent disregard irrelevant or inappropriate content to answer accurately. Competing information is often present, but it is not more prominent than the correct information.
Level 4 **326–375 points**	Tasks at this level often require respondents to perform multi-step operations to integrate, interpret, or synthesize information from complex or lengthy continuous, noncontinuous, mixed, or multiple-type texts. Complex inferences and application of background knowledge may be needed to perform the task successfully. Many tasks require identifying and understanding one or more specific, noncentral idea(s) in the text in order to interpret or evaluate subtle evidence, claims, or persuasive discourse or relationships. Conditional information is frequently present in tasks at this level and must be taken into consideration by the respondent. Competing information is present and sometimes seemingly as prominent as correct information.
Level 5 **376–500 points**	At this level, tasks may require the respondent to search for and integrate information across multiple, dense texts; construct syntheses of similar and contrasting ideas or points of view; or evaluate evidence-based arguments. Application and evaluation of logical and conceptual models of ideas may be required to accomplish tasks. Evaluating the reliability of evidentiary sources and selecting key information is frequently a requirement. Tasks often require respondents to be aware of subtle, rhetorical cues and to make high-level inferences or use specialized background knowledge.

Source: US Department of Education

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Appendix C: Detailed Impact Results

Impact of Earnings Losses due to Shortages of Workers with Level 3 Literacy Levels

The Current Annual Impact (as of 2020) of the Earnings Losses Resulting from a Shortage of Workers Meeting Requisite Literacy Standards on Business Activity in the Permian Basin

Results by Industry

Industry	Total Expenditures	Gross Product	Personal Income	Jobs
Agriculture	-4.9 m	-1.4 m	-0.9 m	-14
Mining	-3.9 m	-0.9 m	-0.4 m	-2
Utilities	-19.1 m	-4.3 m	-1.9 m	-8
Construction	-5.3 m	-2.7 m	-2.2 m	-29
Manufacturing	-16.3 m	-4.5 m	-2.5 m	-34
Wholesale Trade	-6.3 m	-4.3 m	-2.5 m	-26
Retail Trade*	-71.5 m	-54.0 m	-31.5 m	-893
Transportation & Warehousing	-7.5 m	-5.2 m	-3.4 m	-43
Information	-7.0 m	-4.3 m	-1.9 m	-16
Financial Activities*	-41.1 m	-4.9 m	-1.9 m	-18
Business Services	-6.4 m	-3.6 m	-2.9 m	-33
Health Services	-12.6 m	-8.9 m	-7.5 m	-116
Other Services	-24.6 m	-12.8 m	-10.2 m	-206
Total, All Industries	**-226.4 m**	**-111.7 m**	**-69.7 m**	**-1,438**

Source: US Multi-Regional Impact Assessment System, The Perryman Group

Notes: Monetary values given in millions of 2021 US dollars per year. Components may not sum due to rounding. Retail Trade includes Restaurants, Financial Activities includes Real Estate.

Based on total estimated shortfall in workers at or above Level 3 Literacy (adjusted for workforce participation rates), current labor demand in the Permian Basin, and earnings losses associated with lower skill levels. Local losses arising from the foregone earnings are fully adjusted for incremented taxes and typical spending and savings patterns, including out-of-area outlays. This analysis makes use of current data and projections for industrial employment within the region derived from the US Multi-Regional Econometric Model and resulting occupational requirements as estimated within the US Multi-Regional Industry-Occupation System. The downstream effects of the spending were determined using the Permian Basin submodel of the US Multi-Regional Impact Assessment System. For purposes of this analysis, the Permian Basin Region is defined as Midland, Ector, Reeves, Pecos, Loving, Ward, Winkler, Culberson, Andrews, Martin, Gaines, Howard, Glasscock, Reagan, Upton, Crane, Terrell, Crockett, and Yoakum counties of Texas as well as Eddy, Lea, and Chaves counties of New Mexico.

The Projected Annual Impact (as of 2030) of the Earnings Losses Resulting from a Shortage of Skilled Workers Meeting Requisite Literacy Standards on Business Activity in the Permian Basin

Results by Industry

Industry	Total Expenditures	Gross Product	Personal Income	Jobs
Agriculture	-12.9 m	-3.6 m	-2.4 m	-36
Mining	-10.1 m	-2.3 m	-1.2 m	-6
Utilities	-49.8 m	-11.2 m	-4.9 m	-20
Construction	-13.7 m	-7.0 m	-5.8 m	-76
Manufacturing	-42.6 m	-11.6 m	-6.5 m	-90
Wholesale Trade	-16.4 m	-11.1 m	-6.4 m	-68
Retail Trade*	-186.8 m	-141.1 m	-82.2 m	-2,331
Transportation & Warehousing	-19.6 m	-13.5 m	-8.9 m	-113
Information	-18.3 m	-11.3 m	-4.8 m	-40
Financial Activities*	-107.2 m	-12.9 m	-5.0 m	-48
Business Services	-16.8 m	-9.4 m	-7.6 m	-87
Health Services	-32.8 m	-23.3 m	-19.7 m	-304
Other Services	-64.1 m	-33.4 m	-26.5 m	-537
Total, All Industries	**-591.1 m**	**-291.6 m**	**-181.9 m**	**-3,755**

Source: US Multi-Regional Impact Assessment System, The Perryman Group

Notes: Monetary values given in millions of 2021 US dollars per year. Components may not sum due to rounding. Retail Trade includes Restaurants, Financial Activities includes Real Estate.

Based on total anticipated shortfall in workers at or above Level 3 Literacy (adjusted for workforce participation rates), projected labor demand in the Permian Basin, and earnings losses associated with lower skill levels. Local losses arising from the foregone earnings are fully adjusted for incremented taxes and typical spending and savings patterns, including out-of-area outlays. This analysis makes use of current data and projections for industrial employment within the region derived from the US Multi-Regional Econometric Model and resulting occupational requirements as estimated within the US Multi-Regional Industry-Occupation System. The downstream effects of the spending were determined using the Permian Basin submodel of the US Multi-Regional Impact Assessment System. For purposes of this analysis, the Permian Basin Region is defined as Midland, Ector, Reeves, Pecos, Loving, Ward, Winkler, Culberson, Andrews, Martin, Gaines, Howard, Glasscock, Reagan, Upton, Crane, Terrell, Crockett, and Yoakum counties of Texas as well as Eddy, Lea, and Chaves counties of New Mexico.

The Projected Annual Impact (as of 2040) of the Earnings Losses Resulting from a Shortage of Skilled Workers Meeting Requisite Literacy Standards on Business Activity in the Permian Basin

Results by Industry

Industry	Total Expenditures	Gross Product	Personal Income	Jobs
Agriculture	-20.8 m	-5.8 m	-3.9 m	-58
Mining	-16.3 m	-3.7 m	-1.9 m	-10
Utilities	-80.4 m	-18.0 m	-7.9 m	-32
Construction	-22.2 m	-11.4 m	-9.4 m	-123
Manufacturing	-68.8 m	-18.8 m	-10.5 m	-145
Wholesale Trade	-26.5 m	-18.0 m	-10.4 m	-110
Retail Trade*	-301.8 m	-227.9 m	-132.7 m	-3,765
Transportation & Warehousing	-31.7 m	-21.8 m	-14.4 m	-183
Information	-29.6 m	-18.3 m	-7.8 m	-65
Financial Activities*	-173.2 m	-20.9 m	-8.1 m	-77
Business Services	-27.2 m	-15.1 m	-12.3 m	-140
Health Services	-53.0 m	-37.6 m	-31.8 m	-491
Other Services	-103.6 m	-54.0 m	-42.8 m	-868
Total, All Industries	**-955.0 m**	**-471.2 m**	**-293.9 m**	**-6,067**

Source: US Multi-Regional Impact Assessment System, The Perryman Group

Notes: Monetary values given in millions of 2021 US dollars per year. Components may not sum due to rounding. Retail Trade includes Restaurants, Financial Activities includes Real Estate.

Based on total anticipated shortfall in workers at or above Level 3 Literacy (adjusted for workforce participation rates), projected labor demand in the Permian Basin, and earnings losses associated with lower skill levels. Local losses arising from the foregone earnings are fully adjusted for incremented taxes and typical spending and savings patterns, including out-of-area outlays. This analysis makes use of current data and projections for industrial employment within the region derived from the US Multi-Regional Econometric Model and resulting occupational requirements as estimated within the US Multi-Regional Industry-Occupation System. The downstream effects of the spending were determined using the Permian Basin submodel of the US Multi-Regional Impact Assessment System. For purposes of this analysis, the Permian Basin Region is defined as Midland, Ector, Reeves, Pecos, Loving, Ward, Winkler, Culberson, Andrews, Martin, Gaines, Howard, Glasscock, Reagan, Upton, Crane, Terrell, Crockett, and Yoakum counties of Texas as well as Eddy, Lea, and Chaves counties of New Mexico.

The Projected Annual Impact (as of 2050) of the Earnings Losses Resulting from a Shortage of Skilled Workers Meeting Requisite Literacy Standards on Business Activity in the Permian Basin

Results by Industry

Industry	Total Expenditures	Gross Product	Personal Income	Jobs
Agriculture	-29.0 m	-8.0 m	-5.4 m	-80
Mining	-22.6 m	-5.1 m	-2.6 m	-14
Utilities	-111.9 m	-25.1 m	-11.0 m	-45
Construction	-30.8 m	-15.8 m	-13.0 m	-171
Manufacturing	-95.7 m	-26.2 m	-14.6 m	-202
Wholesale Trade	-36.9 m	-25.0 m	-14.4 m	-153
Retail Trade*	-419.9 m	-317.1 m	-184.7 m	-5,239
Transportation & Warehousing	-44.0 m	-30.3 m	-20.0 m	-255
Information	-41.1 m	-25.4 m	-10.9 m	-91
Financial Activities*	-241.0 m	-29.0 m	-11.3 m	-107
Business Services	-37.8 m	-21.0 m	-17.2 m	-195
Health Services	-73.7 m	-52.3 m	-44.2 m	-683
Other Services	-144.2 m	-75.2 m	-59.6 m	-1,207
Total, All Industries	**-1,328.8 m**	**-655.6 m**	**-408.9 m**	**-8,442**

Source: US Multi-Regional Impact Assessment System, The Perryman Group

Notes: Monetary values given in millions of 2021 US dollars per year. Components may not sum due to rounding. Retail Trade includes Restaurants, Financial Activities includes Real Estate.

Based on total anticipated shortfall in workers at or above Level 3 Literacy (adjusted for workforce participation rates), projected labor demand in the Permian Basin, and earnings losses associated with lower skill levels. Local losses arising from the foregone earnings are fully adjusted for incremented taxes and typical spending and savings patterns, including out-of-area outlays. This analysis makes use of current data and projections for industrial employment within the region derived from the US Multi-Regional Econometric Model and resulting occupational requirements as estimated within the US Multi-Regional Industry-Occupation System. The downstream effects of the spending were determined using the Permian Basin submodel of the US Multi-Regional Impact Assessment System. For purposes of this analysis, the Permian Basin Region is defined as Midland, Ector, Reeves, Pecos, Loving, Ward, Winkler, Culberson, Andrews, Martin, Gaines, Howard, Glasscock, Reagan, Upton, Crane, Terrell, Crockett, and Yoakum counties of Texas as well as Eddy, Lea, and Chaves counties of New Mexico.

Potential Benefits of Improving Literacy Levels in the Permian Basin

The Projected Annual Benefits (as of 2040) of the Earnings Increases Resulting from Enhanced Levels of Literacy on Business Activity in the Permian Basin - Scenario 1
Results by Industry

Industry	Total Expenditures	Gross Product	Personal Income	Jobs
Agriculture	+$23.1 m	+$6.4 m	+$4.3 m	+64
Mining	+$18.0 m	+$4.1 m	+$2.1 m	+11
Utilities	+$89.1 m	+$20.0 m	+$8.7 m	+35
Construction	+$24.6 m	+$12.6 m	+$10.4 m	+136
Manufacturing	+$76.2 m	+$20.8 m	+$11.6 m	+161
Wholesale Trade	+$29.4 m	+$19.9 m	+$11.5 m	+122
Retail Trade*	+$334.5 m	+$252.6 m	+$147.1 m	+4,173
Transportation & Warehousing	+$35.1 m	+$24.1 m	+$16.0 m	+203
Information	+$32.8 m	+$20.3 m	+$8.7 m	+72
Financial Activities*	+$192.0 m	+$23.1 m	+$9.0 m	+85
Business Services	+$30.1 m	+$16.8 m	+$13.7 m	+156
Health Services	+$58.7 m	+$41.7 m	+$35.2 m	+544
Other Services	+$114.9 m	+$59.9 m	+$47.5 m	+962
Total, All Industries	**+$1,058.5 m**	**+$522.3 m**	**+$325.7 m**	**+6,725**

Source: US Multi-Regional Impact Assessment System, The Perryman Group
Notes: Monetary values given in millions of 2021 US dollars per year. Components may not sum due to rounding. Retail Trade includes Restaurants, Financial Activities includes Real Estate.
Scenario 1 assumes that the Permian Basin Region achieves a percentage of Level 3 Literacy equivalent to that of the states of Texas and New Mexico as of 2040. Local gains arising from the enhanced earnings are fully adjusted for incremented taxes and typical spending and savings patterns, including out-of-area outlays. This analysis makes use of current data and projections for industrial employment within the region derived from the US Multi-Regional Econometric Model and resulting occupational requirements as estimated within the US Multi-Regional Industry-Occupation System. The downstream effects of the spending were determined using the Permian Basin submodel of the US Multi=Regional Impact Assessment System. For purposes of this analysis, the Permian Basin Region is defined as Midland, Ector, Reeves, Pecos, Loving, Ward, Winkler, Culberson, Andrews, Martin, Gaines, Howard, Glasscock, Reagan, Upton, Crane, Terrell, Crockett, and Yoakum counties of Texas as well as Eddy, Lea, and Chaves counties of New Mexico.

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The Projected Annual Benefits (as of 2040) of the Earnings Increases Resulting from Enhanced Levels of Literacy on Business Activity in the Permian Basin - Scenario 2

Results by Industry

Industry	Total Expenditures	Gross Product	Personal Income	Jobs
Agriculture	+$38.3 m	+$10.6 m	+$7.2 m	+106
Mining	+$29.9 m	+$6.8 m	+$3.5 m	+18
Utilities	+$147.9 m	+$33.2 m	+$14.5 m	+59
Construction	+$40.8 m	+$20.9 m	+$17.2 m	+226
Manufacturing	+$126.5 m	+$34.6 m	+$19.3 m	+267
Wholesale Trade	+$48.8 m	+$33.0 m	+$19.0 m	+202
Retail Trade*	+$555.3 m	+$419.3 m	+$244.2 m	+6,927
Transportation & Warehousing	+$58.2 m	+$40.0 m	+$26.5 m	+337
Information	+$54.4 m	+$33.6 m	+$14.4 m	+120
Financial Activities*	+$318.7 m	+$38.4 m	+$14.9 m	+142
Business Services	+$50.0 m	+$27.8 m	+$22.7 m	+258
Health Services	+$97.4 m	+$69.2 m	+$58.5 m	+903
Other Services	+$190.7 m	+$99.4 m	+$78.8 m	+1,597
Total, All Industries	**+$1,757.1 m**	**+$866.9 m**	**+$540.7 m**	**+11,162**

Source: US Multi-Regional Impact Assessment System, The Perryman Group

Notes: Monetary values given in millions of 2021 US dollars per year. Components may not sum due to rounding. Retail Trade includes Restaurants, Financial Activities includes Real Estate.

Scenario 2 assumes that the Permian Basin Region achieves a percentage of Level 3 Literacy equivalent to that of the United States as of 2040. Local gains arising from the enhanced earnings are fully adjusted for incremented taxes and typical spending and savings patterns, including out-of-area outlays. This analysis makes use of current data and projections for industrial employment within the region derived from the US Multi-Regional Econometric Model and resulting occupational requirements as estimated within the US Multi-Regional Industry-Occupation System. The downstream effects of the spending were determined using the Permian Basin submodel of the US Multi-Regional Impact Assessment System. For purposes of this analysis, the Permian Basin Region is defined as Midland, Ector, Reeves, Pecos, Loving, Ward, Winkler, Culberson, Andrews, Martin, Gaines, Howard, Glasscock, Reagan, Upton, Crane, Terrell, Crockett, and Yoakum counties of Texas as well as Eddy, Lea, and Chaves counties of New Mexico.

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The Projected Annual Benefits (as of 2040) of the Earnings Increases Resulting from Enhanced Levels of Literacy on Business Activity in the Permian Basin - Scenario 3

Results by Industry

Industry	Total Expenditures	Gross Product	Personal Income	Jobs
Agriculture	+$63.9 m	+$17.7 m	+$11.9 m	+177
Mining	+$49.9 m	+$11.3 m	+$5.8 m	+30
Utilities	+$246.6 m	+$55.4 m	+$24.2 m	+98
Construction	+$68.0 m	+$34.8 m	+$28.7 m	+377
Manufacturing	+$211.0 m	+$57.7 m	+$32.1 m	+445
Wholesale Trade	+$81.4 m	+$55.1 m	+$31.8 m	+337
Retail Trade*	+$925.7 m	+$699.0 m	+$407.2 m	+11,549
Transportation & Warehousing	+$97.1 m	+$66.7 m	+$44.1 m	+562
Information	+$90.7 m	+$56.1 m	+$23.9 m	+201
Financial Activities*	+$531.4 m	+$64.0 m	+$24.9 m	+236
Business Services	+$83.4 m	+$46.4 m	+$37.8 m	+430
Health Services	+$162.4 m	+$115.3 m	+$97.5 m	+1,505
Other Services	+$317.9 m	+$165.7 m	+$131.4 m	+2,662
Total, All Industries	**+$2,929.3 m**	**+$1,445.2 m**	**+$901.4 m**	**+18,609**

Source: US Multi-Regional Impact Assessment System, The Perryman Group

Notes: Monetary values given in millions of 2021 US dollars per year. Components may not sum due to rounding. Retail Trade includes Restaurants, Financial Activities includes Real Estate.

Scenario 3 assumes that the Permian Basin Region achieves a percentage of Level 3 Literacy equivalent to that of the top five states in the United States as of 2040. Local gains arising from the enhanced earnings are fully adjusted for incremented taxes and typical spending and savings patterns, including out-of-area outlays. This analysis makes use of current data and projections for industrial employment within the region derived from the US Multi-Regional Econometric Model and resulting occupational requirements as estimated within the US Multi-Regional Industry-Occupation System. The downstream effects of the spending were determined using the Permian Basin submodel of the US Multi-Regional Impact Assessment System. For purposes of this analysis, the Permian Basin Region is defined as Midland, Ector, Reeves, Pecos, Loving, Ward, Winkler, Culberson, Andrews, Martin, Gaines, Howard, Glasscock, Reagan, Upton, Crane, Terrell, Crockett, and Yoakum counties of Texas as well as Eddy, Lea, and Chaves counties of New Mexico.

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