



The Keystone XL Pipeline:

*REMI Estimates of Economic Impacts from
Construction and Operations based on the
Keystone Record©*

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The Keystone XL Pipeline:

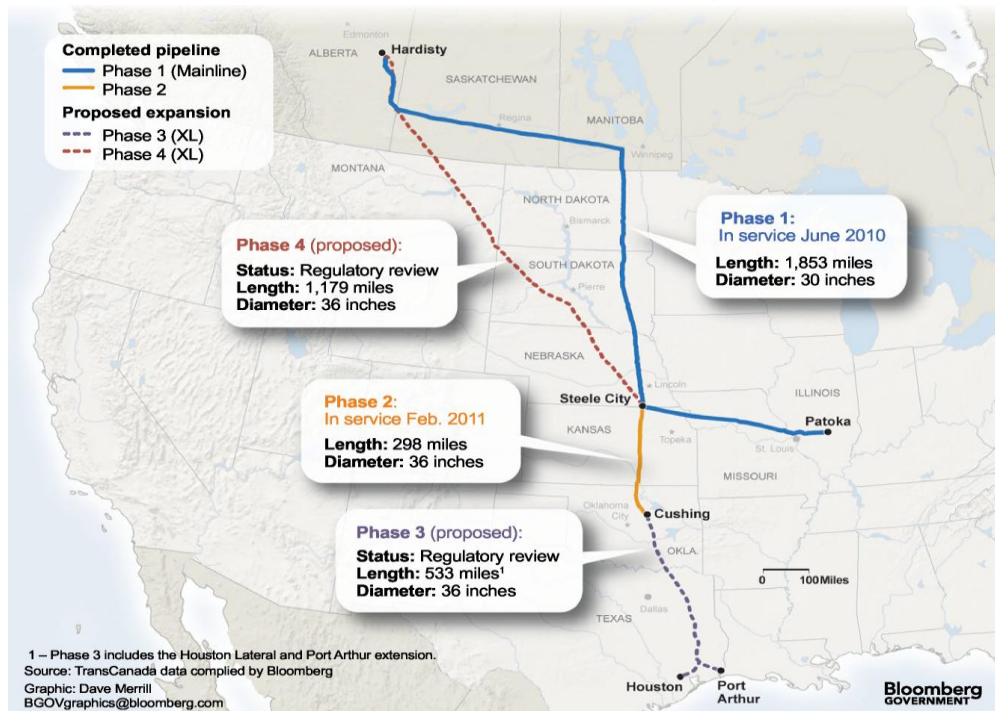
REMI Estimates of Economic Impacts from Construction and Operations based on the Keystone Record©

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1. Using the REMI model to re-estimate the economic implications from findings in other Keystone XL reports of record

The Keystone XL Pipeline, proposed by TransCanada, will carry oil sands crude oil from Alberta to the U.S. Gulf Coast, as shown on this *Bloomberg* map:³



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³ Map used with permission.

The “XL” portions of the Keystone pipeline are extensions of the existing Phases 1 and 2 to crude terminals at Steel City, NE, Cushing, OK, and to the refineries in PADD 2. The proposed Phase 3 will bring rapidly increasing supplies of Canadian crude oil to the Gulf Coast refineries. Phase 4 will further streamline this route and adds capacity to move 700 KBD to the Gulf Coast while maintaining capacity to move 591 KBD to PADD2.

Proponents of the Keystone XL (KXL) report that the claimed \$7 billion construction of the 1,700-mile long pipeline will create tens of thousands of jobs in the U.S. No research that we have identified can substantiate these claims. Proponents imply that stable oil supplies from the KXL will lower the cost of petroleum products across the United States and thereby create hundreds of thousands of permanent jobs. These further estimates are unsupported by any other research that we have identified.⁴

Ignoring the political debate about the environmental and safety issues of the proposed pipeline, we have examined the studies in the “KXL Record” to shed light on the range of economic impacts reported by TransCanada’s consultant, the Perryman Group.⁵ The Global Labor Institute (GLI) at Cornell University criticized the Perryman report.⁶ We use the REMI PI⁺ model to re-estimate the Perryman economic impacts—using the same input data—and to estimate original values from data corrections identified in the GLI paper. To consider the claimed permanent job impacts of operating KXL, we examined the underlying crude and product markets discussed by other experts, who have written about KXL, to formulate a REMI scenario of ongoing economic impacts. We exclude the CERI research on the cross-border economic impacts of Alberta’s oil sands development in order to isolate the incremental KXL impacts.⁷

Section 2 of the paper briefly contrasts the REMI model with what we could discover about the model used by TransCanada’s consultant. Section 3 reports construction economic impacts based on TransCanada’s consultant’s reported information and GLI’s corrections. Section 4 discusses identified expert opinions and market forces bearing upon our scenario to examine ongoing annual economic impacts. Our purpose in this section is only to postulate one reasonable outcome, not a full range of possibilities.

⁴ A February 13, 2012 article by Jim Efstathiou, Jr. on *Bloomberg*, “Keystone’s Thousands of Jobs Fall to 20 When Pipeline Opens,” provides a brief overview of research in the record, some of which we discuss at length.

⁵ “The Impact of Developing the Keystone XL Pipeline Project on Business Activity in the US: An Analysis Including State-by-State Construction Effects and an Assessment of the Potential Benefits of a More Stable Source of Domestic Oil Supply.” The report is available on the Perryman Group’s website. See also state-by-state reports, dated June 2010.

⁶ “Pipe Dreams? – Jobs Gained, Jobs Lost by the Construction of Keystone XL,” September 2011, revised January 2012.

⁷ Canadian Energy Research Institute, “Economic Impacts of New Oil Sands Projects in Alberta (2010-2035),” Study 124, May 2011; “Economic Impacts of Staged Development of Oil Sands Projects in Alberta (2010-2035),” Study 125, June 2011.

Section 5 provides bullet point summaries of our findings. Keep in mind that this paper is aimed at illustrating the capability of the REMI Model, not to produce the definitive study of KXL.

2. The REMI model versus Perryman's model system

For this study, we used the REMI PI⁺ macroeconomic model. This software model is in use throughout the U.S. at all levels of government, private industry, policy research, think tanks, and academia.⁸ It combines multiple methodologies for regional assessment, which helps overcome individual methods' weaknesses while highlighting their strengths. This includes input-output tabulation, which captures inter-industry relationships. It also includes econometric estimations, which use advanced statistics to quantify other economic relationships. In the longer-term, the REMI model has similarities to computable general equilibrium (CGE) models, and it utilizes New Economic Geography concepts, which illustrate the spatial capacities of a regional economy.⁹ REMI is transparent about the PI⁺ model software, including its assumptions,¹⁰ equations,¹¹ and data sources.¹² Since 1980, the company has published all major changes or additions to the model in peer-reviewed academic journals.¹³

The Perryman Group relies on a proprietary model called the "U.S. Multi-Regional Impact Assessment System (USMRIAS)." While private firms produced both the PI⁺ model and USMRIAS, it appears the Perryman Group only uses its model internally, while REMI licenses its model software to a diverse set of clients, which increases its exposure and the chance for constructive criticism of any analytical shortcomings.

According to documentation in a few Perryman Group studies,¹⁴ including their Keystone XL work, input-output tabulation is the main methodology inside of USMRIAS.

⁸ For a sample of REMI users by subject area, please see this page on their website, http://www.remi.com/index.php?page=topic&hl=en_US.

⁹ For a short introduction to the model's structure, theories, and uses, please see this webpage, http://www.remi.com/index.php?page=model&hl=en_US.

¹⁰ REMI posts all of its documentation for its models online, which one can access here, http://www.remi.com/index.php?page=documentation&hl=en_US.

¹¹ See, http://www.remi.com/uploads/File/Documentation/PI_Plus_v1-3/PI+ v1_3_Model_Equations.pdf.

¹² See, http://www.remi.com/uploads/File/Documentation/PI_Plus_v1-3/Data_Sources_and_Estimation_Procedures.pdf.

¹³ These include the *Journal of Regional Science*, *American Economic Review*, *Regional Science Perspectives in Economic Analysis*, *The Review of Economics and Statistics*, and the Transportation Research Board (TRB). For a sample of these articles, see the company website, http://www.remi.com/index.php?page=remi-articles-2&hl=en_US.

¹⁴ See, http://trs.state.tx.us/about/documents/impact_annuity_payments_by_trs.pdf.

Hence, it captures inter-industry relationships and multiplier effects, but it misses the fuller structural implications of policy actions or private decision-making on the economy. For example, the REMI model estimates changes in migration patterns or firms' location decisions in response to economic conditions. REMI also changes consumer demand under similar conditions. The USMRIAS model seems to have no comparable behavioral or demographic section to its model. PI⁺ includes a full household component (with the association personal consumption and labor supply), private industries, government spending, and international trade in its structure.

We are unfamiliar with the details of Perryman's USMRIAS model, despite our search for documentation on their website and in the literature. The Perryman Group's report on KXL states that their model was "used in hundreds of diverse applications across the country and has an excellent reputation for accuracy and credibility."¹⁵ Our results, discussed next, differ from Perryman's findings while using the same inputs.

3. Re-estimated economic impacts from construction, maintenance, and operations

To date, two significant studies reported the labor and capital requirements of the KXL project. These include the Perryman Group study (using the USMRAIS) and the Cornell GLI study. The GLI study provides a critique of the pipeline project, but it does not estimate the economic impact of the pipeline for lack of an applicable economic model. To rectify this situation, we ran three construction scenarios through the REMI PI⁺ model:

- REMI using Perryman's inputs (to compare the scale of the total impacts from the same direct inputs)
- GLI numbers (which provide a more accurate estimate of the direct inputs of KXL)
- Continued operations and maintenance of the pipeline (from more GLI research)

¹⁵ Perryman report, p. 37.

3.1. Economic impact research entails attention to its driving inputs

Pipeline construction is a capital-intensive process. It involves the manufacture of expensive steel pipe segments, heavy equipment to trench the pipeline routes and specialized labor. The heavy Canadian crude of KXL requires large expensive pumps to move the diluted bitumen. Appendix 3 of a *Bloomberg Government* study provides an overview of the activities involved in building a new pipeline of this type.¹⁶

Estimating the economic impact of a large capital investment like KXL requires particular economic expertise and complex regional models. Assuming such skill and a competent model, the challenge then is to develop accurate inputs. Examining your results with an eye to commonsense is fundamental to empirical economic analysis—do these results make sense?

The Perryman Group of Waco, TX, under contract to TransCanada, estimated that construction of KXL would add 118,935 person-years of employment to the U.S. economy over two years of work. This means their analysis says the pipeline would create 59,468 jobs for each of those two years. These estimations do not pass our commonsense test, and they conflict with a report from the Department of State on the scale of the project. This induced us to undertake a re-estimation of the economic impact of KXL with the REMI model.¹⁷

3.2. The Cornell GLI study identified errors in Perryman's research

The Global Labor Institute study of January 2012 identified significant factual errors with the direct expenditures in the U.S. remaining to complete KXL of the Perryman report. Of the total \$7 billion price tag to complete the project, GLI reported:

- Around 23% of KXL expenditures, or \$1.6 billion, will not occur in the U.S. and cannot provide a significant domestic stimulus. This \$1.6 billion goes towards construction the Canadian portion of the pipeline.
- Only \$3.0 billion to \$4.0 billion of the remaining \$5.4 billion remain for investment in the U.S. economy. The remaining cash goes towards

¹⁶ Jason Arvelo, "The Oil Sands Pipeline: Construction Jobs Impact, Part 2," November 10, 2011.

¹⁷ For a summary of the Department of State's conclusions about the direct job impacts of KXL, please see this article, <http://indiancountrytodaymedianetwork.com/2012/01/19/state-department-reports-little-economic-benefit-to-rejected-keystone-xl-pipeline-73379>. However, the State report did not estimate the secondary and supply chain jobs created by this smaller number of direct job inputs, which we seek to correct with GLI inputs to REMI.

maintenance and upgrades to the previous portions of the pipeline. Thus, this money is irrelevant to the policy decision about the approval of the XL portion of the line or not.

- Half or more of the steel pipe for the KXL is on contract to Indian and Russian companies. Their production facilities are located in India and Canada, with the possibility of some finishing work in Arkansas. This capital, nearly \$1.0 billion in steel pipe and support services, will not flow to American companies, and therefore not stimulate the U.S. economy or provide jobs for its workers.¹⁸

Visual inspection of the pipe's route reveals that KXL is complete between Steel City, NE and Cushing, OK (across Kansas). For this section, only new pump stations (to increase crude capacity) are necessary. GLI reports that TransCanada had reported the need for only thirty to sixty direct jobs to upgrade the preexisting Kansas segment. Yet, the economic impact for a new, "from scratch" pipeline is present in the Perryman Group's report. Accounting for ripple (secondary) effects, Perryman includes 6,721 total jobs in Kansas that will not exist. Our analysis adjusts for this fact from GLI data, and we found a smaller jobs result.

Perryman estimated that the direct construction and manufacturing tasks related to the entire project would employ 15,000 construction workers and 3,000 workers in metal manufacturing and fabrication. Some reports show 20,000 direct construction and manufacturing jobs. The overstated U.S. expenditures of \$7.0 billion (when the true number is closer to \$3.0 billion)¹⁹ and the inclusion of steel pipe manufacturing in the U.S. drive these overestimations.

3.3. The REMI model estimates are lower than Perryman estimates

Our results show the following: Perryman's estimations of job creation and economic activity due to the KXL are higher than they are in the REMI model, using the same inputs. Due to the lack of documentation on USMRIAS, the precise reason for this discrepancy is difficult to ascertain. The REMI model includes a higher level of labor productivity than the USMRIAS, which might account for some of the differences in the number of job-years needed to complete the project. REMI also includes an automatic

¹⁸ GLI discusses this on pp. 11-14. *Bloomberg* reported on February 13, 2012 that the Russian enterprise would make at least part of the pipe at its plant in Alberta; the Indian company will produce the pipe near Mumbai with some final processing at a plant in Arkansas.

¹⁹ GLI report, p. 5.

“trade flow” parameter, which allows for foreign importation of intermediate supplies (including steel pipeline) based on historical data and forecast methodologies. Perryman appears to have no comparable concept in USMRIAS, which accounts for some of the higher numbers.

U.S. (2013/2014 average)	Units	Perryman Group ²⁰	REMI	GLI/REMI
Total Employment	Thousands	59.468	36.860	16.149
Business Sales	2011 \$ (billions)	\$20.93	\$9.22	\$6.01
Gross Domestic Product (GDP)	2011 \$ (billions)	\$9.61	\$5.14	\$3.12
Personal Income	Current \$ (billions)	\$6.50	\$3.19	\$1.36
Personal Income per Job	Annual \$	\$54,651	\$43,327	\$42,047

Figure 3.3.1 – This table shows the economic impact of the construction of KXL based on inputs from different studies and two different models. The Perryman Group’s results are their own; “REMI” is results of Perryman’s inputs in the REMI PI+ model; GLI/REMI takes GLI’s corrected inputs and runs them through the same REMI model.

Even accounting for identical inputs, Perryman’s study estimates a higher potential impact of the KXL. Perryman’s state-by-state reports sum to a direct investment of \$6.56 billion. This implies an output multiplier of 3.2 when dividing total output change by the direct investment. For REMI, the multiplier is closer to 1.4, a much more believable and realistic estimation given the capital-intensity of the projection and its propensity for foreign sourcing of input materials and professional services. The job multipliers between the Perryman Group and REMI models show a similar difference. In addition, Perryman reports a higher average wage for jobs created compared to REMI. This contributes to higher job impacts, as these “induced” effects mean more spending in the economy.

The GLI/REMI run includes only \$3.0 billion of direct investment, per the GLI research, and thus has a much more conservative and realistic estimation of the impact of KXL. This model simulation also removed demand for intermediate supplies—steel pipeline and some professional services—from the states of pipeline construction. GLI research

²⁰ Perryman report from June 2010.

shows a majority of the hundreds of millions worth of steel pipeline will come from foreign plants, and support services for KXL (such as design, marketing, and legal services) are likely to come from Canada.²¹ Perryman seems to assume that these inputs came from Texas, which is particularly strong in industries supporting oil and gas development. TransCanada is a Canadian firm; most likely it will contract these service needs from a similar base of support industries in Alberta.²²

The remainder of this section reports our GLI/REMI simulation results, which we believe are the most accurate from the “Keystone Record” that we examined.

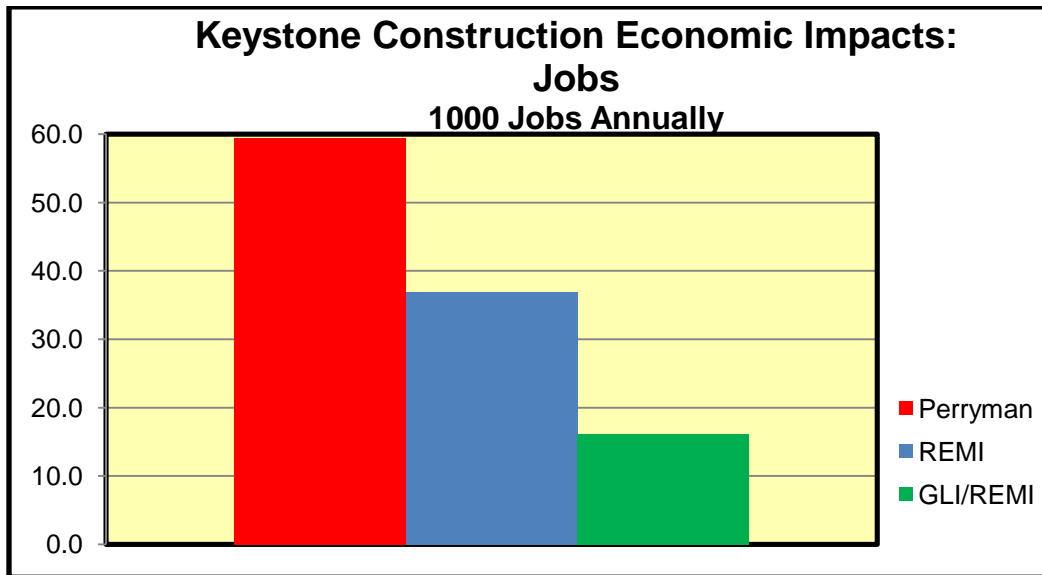


Figure 3.3.2 – This is a graph of the total jobs impacts from Figure 3.3.1. Perryman reports 60,000 job-years, while the same inputs in REMI produce approximately 36,000. In either case, both of these numbers are overestimations from Perryman inputs, as more accurate data leads to an estimation of 16,000 job-years from KXL.

²¹ GLI report, pp. 15-16.

²² Ibid.

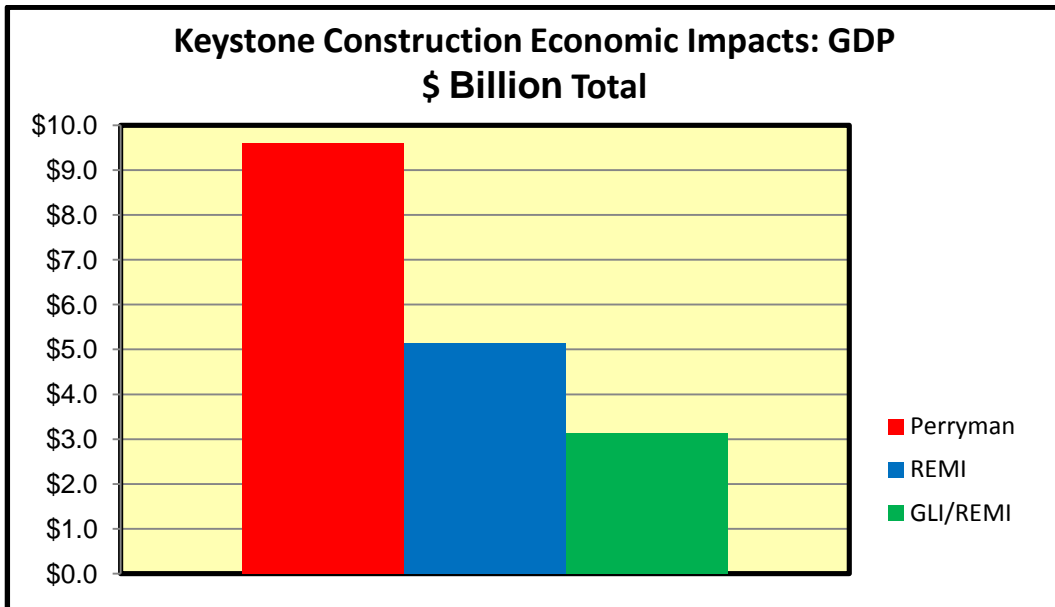


Figure 3.3.3 – This graphs the total GDP impacts. Perryman’s GDP multiplier estimations are high for a project of this type,²³ while the REMI and GLI/REMI outputs scale roughly with the size of the initial inputs (either \$6.56 billion or \$3.0 billion across the states in the planned pathway of KXL).

Subtracting Kansas, five states remain as a “new build” for the KXL region: Montana, South Dakota, Nebraska, Oklahoma, and Texas. The GLI report discusses the re-estimation of direct job-years and the process of sorting workers into “spreads” across the length of the pipeline.²⁴ For this section, we took GLI estimations of direct job inputs (which have an expected midpoint of 3,575),²⁵ direct capital investment (\$3.0 billion), and adjusted for the foreign sourcing of particular input materials and services. This gave us direct inputs to perform an economic impact analysis of the project. We put these into the states by using the length of the uncompleted pipeline as a proportional weight.²⁶ The following is our estimate of KXL’s impact in the six states in its pathway and the U.S. economy as the whole.

²³ The GLI report discusses the issue of job and GDP multipliers in pipeline projects from pp. 7-9.

²⁴ GLI report, p. 7.

²⁵ Ibid.

²⁶ Perryman report, p. 11. We subtracted the already-completed portion of the line in Kansas.

Kansas	Units	2013	2014
Total Employment	Thousands	.236	.241
Private, Non-Farm Employment	Thousands	.218	.222
Business Sales	2011 \$ (billions)	\$.025	\$.026
Gross State Product (GSP)	2011 \$ (billions)	\$.013	\$.014
Personal Income	Current \$ (billions)	\$.009	\$.011
Disposable Personal Income	Current \$ (billions)	\$.008	\$.009
Population	Thousands	.014	.024
Migration	Thousands	.014	.010

As noted, the impact in Kansas is much less than the other states. KXL is complete across that state besides some minor upgrades to pipeline capacity. We modeled a two-year build for KXL through 2013 and 2014 on account of media reports that TransCanada delayed the project's opening to 2015 pending regulatory approval.²⁷

Montana	Units	2013	2014
Total Employment	Thousands	1.720	1.761
Private, Non-Farm Employment	Thousands	1.386	1.420
Business Sales	2011 \$ (billions)	\$.371	\$.380
Gross State Product (GSP)	2011 \$ (billions)	\$.206	\$.212
Personal Income	Current \$ (billions)	\$.063	\$.074
Disposable Personal Income	Current \$ (billions)	\$.054	\$.063
Population	Thousands	0.351	0.647
Migration	Thousands	0.347	0.284

²⁷ See Ashley Portero, "TransCanada Delays Keystone XL Pipeline to 2015," *International Business Times*, February 14, 2012. Other reports detail TransCanada's decision to postpone opening to 2015.

Nebraska	Units	2013	2014
Total Employment	Thousands	1.552	1.570
Private, Non-Farm Employment	Thousands	1.281	1.295
Business Sales	2011 \$ (billions)	\$.369	\$.376
Gross State Product (GSP)	2011 \$ (billions)	\$.206	\$.212
Personal Income	Current \$ (billions)	\$.062	\$.072
Disposable Personal Income	Current \$ (billions)	\$.054	\$.062
Population	Thousands	.299	.541
Migration	Thousands	.295	.230

South Dakota	Units	2013	2014
Total Employment	Thousands	1.284	1.302
Private, Non-Farm Employment	Thousands	1.026	1.041
Business Sales	2011 \$ (billions)	\$.309	\$.314
Gross State Product (GSP)	2011 \$ (billions)	\$.172	\$.176
Personal Income	Current \$ (billions)	\$.047	\$.054
Disposable Personal Income	Current \$ (billions)	\$.042	\$.049
Population	Thousands	.265	.484
Migration	Thousands	.261	.209

Oklahoma	Units	2013	2014
Total Employment	Thousands	1.312	1.314
Private, Non-Farm Employment	Thousands	1.117	1.125
Business Sales	2011 \$ (billions)	\$.298	\$.294
Gross State Product (GSP)	2011 \$ (billions)	\$.133	\$.130
Personal Income	Current \$ (billions)	\$.040	\$.047
Disposable Personal Income	Current \$ (billions)	\$.034	\$.040
Population	Thousands	.203	.368
Migration	Thousands	.202	.159

Texas	Units	2013	2014
Total Employment	Thousands	3.460	3.534
Private, Non-Farm Employment	Thousands	3.157	3.229
Business Sales	2011 \$ (billions)	\$.663	\$.673
Gross State Product (GSP)	2011 \$ (billions)	\$.310	\$.314
Personal Income	Current \$ (billions)	\$.123	\$.146
Disposable Personal Income	Current \$ (billions)	\$.108	\$.128
Population	Thousands	.434	.814
Migration	Thousands	.437	.364

The following is the result for the other forty-four states that do not lie on the path of the KXL. The PI+ software groups REMI results into “regions”—regions being any collection of counties in the United States, regardless of state lines. This particular model grouped the U.S. into fifty-one regions that represent the fifty states, the District of Columbia, and the net national (when added together).

Non-KXL Regions	Units	2013	2014
Total Employment	Thousands	6.500	6.516
Private, Non-Farm Employment	Thousands	5.984	6.016
Business Sales	2011 \$ (billions)	\$.953	\$.960
GDP	2011 \$ (billions)	\$.508	\$.514
Personal Income	Current \$ (billions)	\$.291	\$.320
Disposable Personal Income	Current \$ (billions)	\$.245	\$.269
Population	Thousands	-1.594	-2.844
Migration	Thousands	-1.556	-1.256

Our results from pipeline states and the rest of the country are added together (for total GDP, job-years, etc.).

United States	Units	2013	2014
Total Employment	Thousands	16.063	16.234
Private, Non-Farm Employment	Thousands	14.172	14.344
Business Sales	2011 \$ (billions)	\$2.99	\$3.023
GDP	2011 \$ (billions)	\$1.551	\$1.572
Personal Income	Current \$ (billions)	\$.635	\$.723
Disposable Personal Income	Current \$ (billions)	\$.546	\$.619

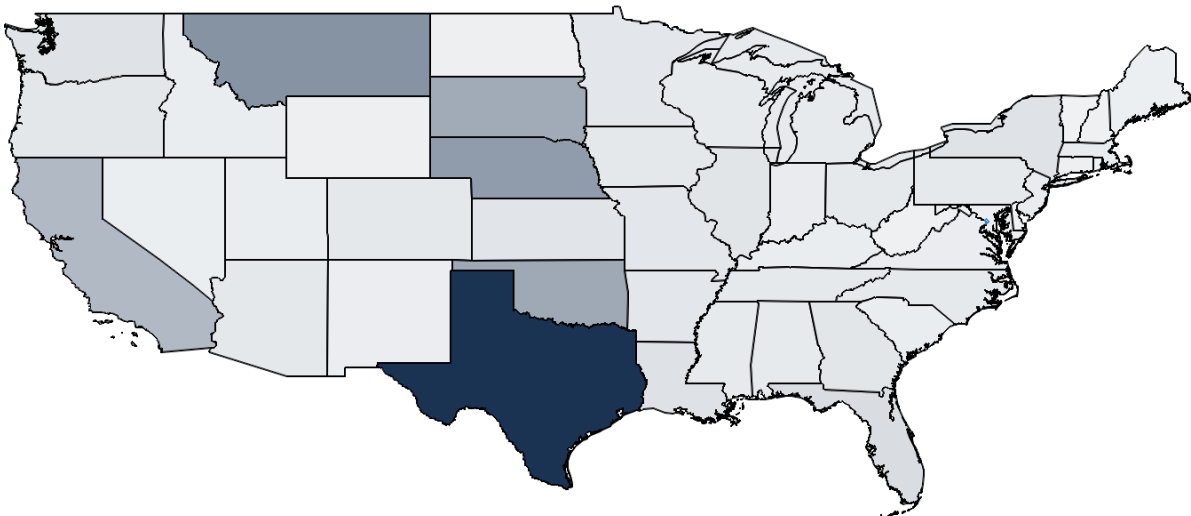


Figure 3.3.4 – This graphs the geographical distribution of job creation from KXL in 2013 using GLI inputs. The maximum, in dark blue, is Texas (with 3,460 jobs), and the minimum, in white, is the District of Columbia. Job creation from KXL is strongest on the states in its direct path. Texas, in particular, sees the largest impact because of the length of the pipeline through the state and it being a source of supply for intermediate goods.

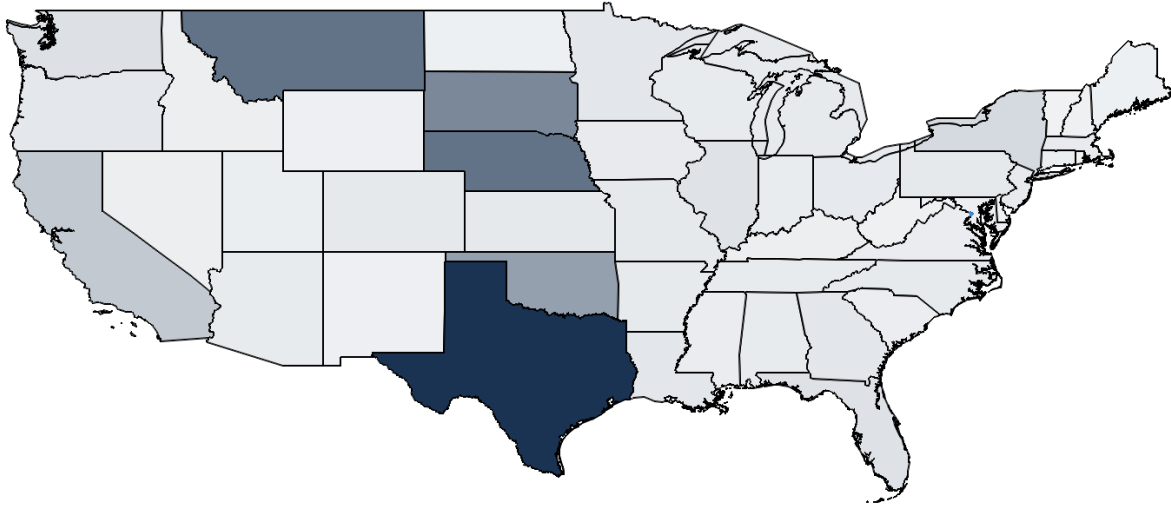


Figure 3.3.5 – This is the same graph, only for gross state product (GSP) instead of jobs. It follows a similar pattern, where Texas is the highest (with \$278 million in additional GSP) and Vermont with the least (at \$1 million GSP).

4. Estimations of permanent effects from the Keystone XL pipeline

The Perryman Group suggests that delivering Canadian oil sands crude to the U.S. Gulf Coast will add stable crude supplies to the American economy, thereby providing a very large stimulus to the labor market and businesses. Other Analyses of KXL’s effect on the crude market, under contract from the Department of Energy and the Department of State, reveal that adding Canadian crude to the U.S. Gulf Coast is a much more complicated situation than assumed by Perryman. The relevant questions to sort out in this paper are:

- What is the effect on refinery crude slates of adding 700 MBD of Canadian heavy crude to the Gulf Cost?
- Does adding the capacity of KXL to bring Canadian crude to the Gulf Coast create economic impacts to the United States as claimed by the Perryman Group?

4.1. Perryman energy market analysis does not support their economic impacts

Besides the nearly 60,000 temporary jobs per year related to construction and manufacture of steel pipeline, the Perryman Group estimated KXL will create 250,348 permanent annual jobs. The explanation in the Perryman report’s estimation of the

lasting “Impact of the Pipeline on US Energy Markets” is truncated from pp. 29-30. The rationale and results are as follows:

The Keystone XL Project would lead to positive outcomes for US energy markets by providing access to a stable source of incremental petroleum supply, reduced risk and, thus, [lower crude cost]... The reduced cost was then allocated across the entire United States economy based on the proprietary 500-sector Perryman model. The various economic sectors would essentially be paying less for the same input than would be the case in the absence of the Keystone XL Project... The annual gains in US business activity stemming from a permanent increase in stable oil supplies include \$29.05 billion annually in GDP, and 250,348 permanent annual jobs.²⁸

The February 13, 2012 story from *Bloomberg* reported that Dr. Perryman advised the reporter that, “the new supply [of crude] from Canada will lower oil prices about 1%.” This claim is not in the Perryman June 2010 report, nor does the report provide any support economic analysis to support this claim.²⁹ A 1% change in oil prices is within a range of statistical error, given the variation and vicissitudes of the world petroleum market. Estimating economic impacts in complicated crude and products markets is meaningless based on these facts alone.

The Perryman assertion that an increase in the supply of Canadian crude delivered to Texas will cause a price reduction in petroleum products overlooks the fact that refiners consume crude oil to make petroleum products consumed largely for transportation fuels (gasoline, jet fuels, and diesel). Prices are set in various world and domestic markets based on complex supply-demand-transportation relationships. These different prices do not necessarily move in sync with each other. Currently, for example, crude oil prices in the Midwest are low due to an ongoing transportation bottleneck that impedes Canadian crude from moving to the Gulf Coast refineries. At the same time, gasoline prices nationwide are rising due to PADD 1 refinery closures and geopolitical uncertainty about Iranian exports.

The correct economic drivers for Perryman’s economic impact model might have been the change in product prices, not crude oil input prices delivered to refineries, if it could be shown that product prices would decline. Perryman provides no analysis to support the claim that Canadian crude will provide a benefit in the form of lower prices for

²⁸ Perryman report, pp. 29-30.

²⁹ Two email requests from Wade (on February 16 and 17, 2012) to info@perrymangroup.com seeking further information about this claim and rationale for the 250,348 jobs went unanswered.

refined products. Their job impacts disappear for lack of a coherent argument or analysis. The Perryman estimates for its economic impact report are mistaken

Two recent studies on the wide-ranging implications of KXL on crude markets³⁰ and their transportation issues by Ensys Energy³¹ and Navigistics Consulting³² completed for the Departments of Energy and State reveal the complexities of U.S. crude markets. The Perryman report contains no similar analysis of either crude or product market forces to support its assumption that, “access to a stable source of incremental petroleum supply [would provide] positive outcomes for U.S. energy markets,” and hence help the U.S. economy as a whole.

4.2. Cornell GLI assumed Midwestern refinery crude supplies would drop

The GLI study identified inadequacies of the Perryman Group’s estimate of permanent economic impacts. They adopted an argument made by petroleum economist Philip Verleger in May 2011. Verleger claimed that TransCanada intended to raise the price of crude in the U.S., not lower them.³³ GLI reported that KXL would increase the price of heavy crude in the Midwest by almost \$2 billion to \$4 billion annually.³⁴ Under this scenario, TransCanada would divert major volumes of Alberta oil sands crude, which now supply refineries in the Midwest, for higher prices on the Gulf Coast and export markets. As a result, households, farmers, and businesses in the Midwest could end up paying 10¢ to 20¢ more per gallon for gasoline and diesel fuels, adding up to \$5 billion to the annual fuel bill of the United States.³⁵

GLI assumed this would cause job losses to offset the jobs gained from the construction phase. However, the GLI “Midwestern effect” is mistaken because increased heavy Canadian crude imports will confront rising Bakken light sweet crude supplies from North Dakota and Montana. The increasing supplies of Alberta crude and the increase in the Bakken supplies assure that no crude shortages will affect refinery crude costs in the Midwest.

³⁰ For these, please see, “Keystone XL Assessment,” December 23, 2010, and “Keystone XL Assessment – No Expansion Update,” August 12, 2011.

³¹ See, <http://www.ensysenergy.com/>.

³² See, <http://www.navigistics.com/>.

³³ Philip Verleger, “If gas prices go up further, blame Canada,” *Minneapolis Star-Tribune*, May 13, 2011.

³⁴ GLI report, p. 27.

³⁵ *Ibid.*

4.3. Likely outcome from a 2012 perspective is near-term Gulf Coast crude surplus

Verleger³⁶ now disavows his opinion from May 2011, which he states³⁷ came from information from TransCanada that they would bypass Midwestern refineries to send their crude to the Gulf Coast and higher prices. Verleger now claims this is no longer the accurate situation. If so, this invalidates GLI's hypothesis that job losses from higher fuel prices in the Midwest would offset construction gains. Canadians will continue to ship crude to Midwestern refineries because it is the shortest haul and because rising Canadian crude supplies dictate that the producers will need to find refiners to take their crude in the Midwest, the Gulf Coast, and the rest of the world. The fastest-growing refinery markets are in the Middle East and Asia, according to Ensys, which shows global refinery expansion by 8 MBD by 2020.³⁸

Although upgrades to Gulf Coast refining capacity are in progress or recently completed, assume for the sake of discussion that Gulf Coast refineries are currently in supply balance. The Energy Information Administration's demand forecast in the U.S. for transportation fuels is flat or up only slightly through 2020.³⁹ How will 700 KBD of Canadian heavy crudes fit into the PADD 3 refineries with the completion of KXL by 2015?

Verleger argued in September that because the joint venture Port Arthur 600 KBD Motiva Refinery is owned by affiliates of Shell and Saudi Aramco, Gulf Coast refining capacity could take more Arab heavy crude. The expanded Middle East crude supply can cut crude prices to displace Canadian suppliers, and refineries will still capture the value-added by selling refined products at world prices. While refinery profit margins could widen in this situation, Verleger still believes that Canadian crude may become surplus on the U.S. Gulf Coast (instead of Arab heavy).⁴⁰

Ensys essentially believes that Canadian crude will displace the Arab heavy imports, writing in a February 21 email, "there might be crude surplus on the Gulf Coast to supply [Gulf Coast] refineries but, over time, we would expect the market to rebalance

³⁶ Philip Verleger, "The Keystone XL Pipeline: OPEC's Trojan Horse," September 2011, <http://www.pkverlegerllc.com/publications/papers/The-Keystone-XL-Pipeline-OPECs-Trojan-Horse-365/>.

³⁷ Verleger telecom with Wade, February 14, 2012.

³⁸ Martin Tallett, Ensys, "U.S. Logistics and Constraints and Supply Developments Rapidly Changing Scenarios for Domestic Refining," Third Annual World Refining Technology Summit, Houston, TX, September 29, 2011.

³⁹ See Energy Information Administration, http://www.eia.gov/forecasts/aeo/er/early_production.cfm.

⁴⁰ Recent email exchanges with Wade confirm that Verleger still believes that Canadian crude will be the surplus crude for the refineries on the U.S. Gulf Coast.

with ‘surplus’ Middle East crudes being reallocated to other regions with refinery growth.”⁴¹

In summary, two leading experts agree that KXL will bring abundant new crude supplies to the Gulf Coast. In the near term, either the Canadians may choose to export some part of this to meet growing world demand or Gulf Coast refineries may choose to back out Middle Eastern crudes in order to take Canadian supplies. Insufficient information is available at this point to conclude which will occur. Ensys’ 2011 update to its Department of Energy study shows that, with or without KXL, increasing supplies of Canadian crude will find its way to the Gulf Coast refineries—and to refineries throughout the rest of the world. If such information were available, the REMI model (which includes a production function, consumer spending, and market prices) could include a scenario on changing product prices in the United States or inputs to refineries. We do not do so here, but we do “make the same assumption” as Perryman in **Section 4.6** as an academic exercise to compare the scale of the two models’ results.

4.4. Uncertain economic forces in world crude markets do not foretell declining product prices for American consumers

Neither the Verleger nor the Ensys viewpoints dictate that American product prices will drop. Gulf Coast refineries will continue to export products and price them according to the world market. The price of refined light products (gasoline, jet fuel, and diesel) for U.S. consumption will not decrease as confounded in the Perryman report. PADD 1 and Caribbean refinery closures in recent months and capacity limitations on the Colonial and Plantation product pipelines from the Gulf Coast to the East Coast assure that prices for light products in the U.S. will remain high. This will remain the case—despite the Energy Information Administration’s forecasts showing little to no demand growth over the 2010s decade. Gulf Coast exports of products may increase or hold steady even while product imports to New York harbor must increase to meet Northeastern demand.

We can consider no sure energy market impact based on refined product price or crude supply disposition uncertainty. The effect of increased competition between Canadian and Arab suppliers suggests that crude input prices may decline during this decade but without effect on consumer product prices. A central result of the KXL is that it will allow Canadian crude one more way to reach growing world refinery demand for crude inputs. The U.S. Gulf Coast is merely one possible route to move Canadian oil sands crude “to

⁴¹ Martin Tallett email to Wade, February 21, 2012.

water,” where it can go anywhere in the world. Other possibilities exist on a “northern route” to British Columbia.

4.5. Cornell GLI operations case reveals very small ongoing economic impacts

We have conducted an impact analysis of KXL in its operations and maintenance. As the construction of a pipeline is a capital-intensive project, with most of the price of the line going towards machinery or input materials and not labor, an operating pipeline runs automatically to a large degree. It requires only a small amount of permanent employees to operate the line and maintain the pipe. GLI conducted an analysis of the permanent jobs associated directly with KXL upon its completion, and concluded it is as small as fifty.⁴² Other reports place this number even lower.⁴³ GLI concluded this number from records about permanent jobs from the non-XL portion of the pipeline in the U.S. and Canada. For this simulation, we entered the fifty jobs into the NAICS⁴⁴ industry for pipeline transportation in the REMI model, spread between the five KXL states by the uncompleted pipeline miles in each state.

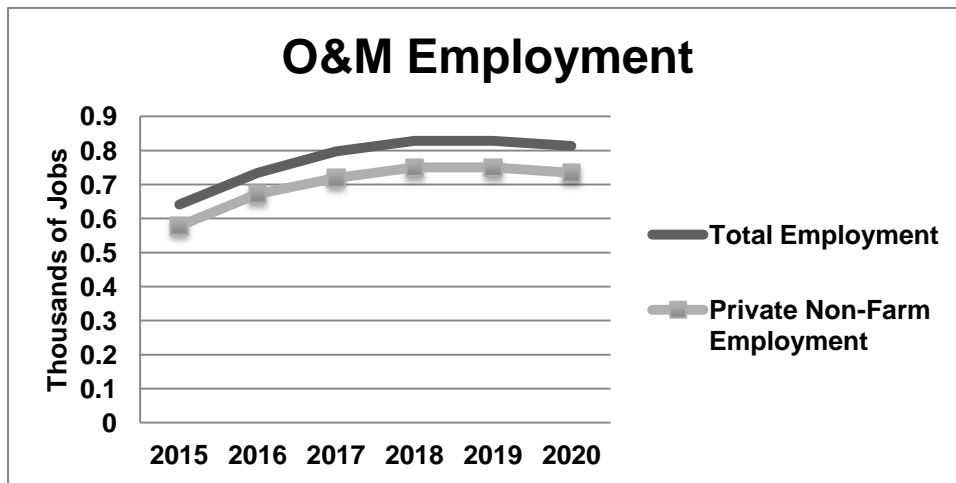


Figure 4.5.1 – The above shows national jobs over the baseline due to KXL. Pipeline operation creates fifty direct jobs, which leads to “spinoff” jobs for intermediate suppliers and additional

⁴² GLI report, p. 25.

⁴³ See n. 4.

⁴⁴ For general information about the NAICS codes, please see the NAICS website here, <http://www.census.gov/eos/www/naics/>. The specific industry code for pipeline transportation is NAICS 486, here, <http://www.census.gov/cgi-bin/sssd/naics/naicsrch?code=486&search=2007%20NAICS%20Search>. For REMI PI+ definitions of industries based off the NAICS code, see here, http://www.remi.com/uploads/File/Documentation/PI_Plus_v1-2/NAICS_Industries_for_PI+_Hierarchical_v1.2.pdf.

consumer spending (due to increased payroll in the economy). To 2020, KXL would increase national employment by approximately 800, which is about a 0.0004% increase in employment in the U.S.—essentially indistinguishable from other noise in the numbers.

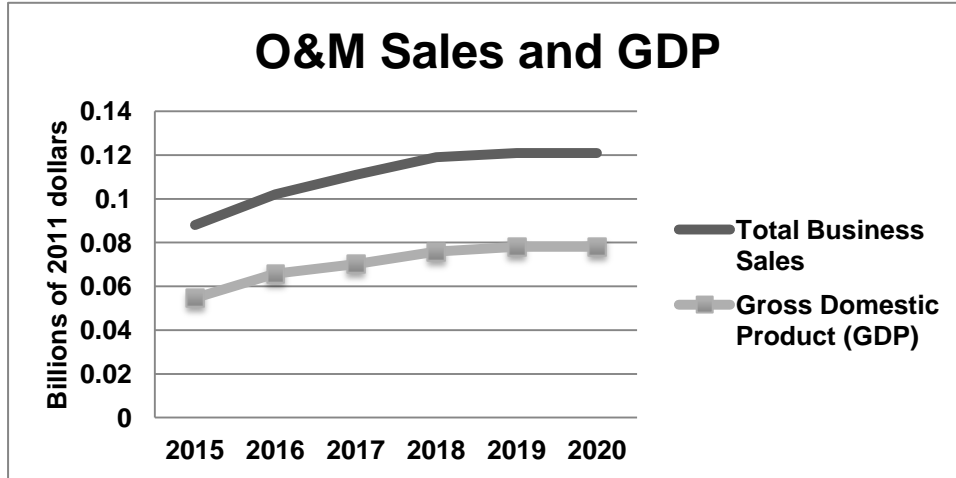


Figure 4.5.2 – Similarly, the impact of KXL in the operations phase is not large within the macroeconomy. This includes an approximately stable \$120 million in business sales and \$80 million in additional GDP per year by 2020. This is a nationwide figure—actual impacts would concentrate on the five new pipeline states, with Texas receiving a disproportionate share over other states due to its clusters for supporting oil development projects.

4.6. Perryman’s reported ongoing gains in U.S. business activity due to stable oil prices compared to REMI model results

After the publication of the June 2010 report, Dr. Perryman claimed that the positive benefits of stable Canadian oil supplies would lower the price of petroleum by 1% in the U.S. market. While we invoke the lengthy discussion above that undermines this claim, we will ignore the conclusion reached in **Section 4.1** that no economic impacts can come from “stable crude supplies.” Academically, we ran a scenario featuring a reduction in the price of all petroleum product fuels nationwide by 1% from 2015 to 2020 and compared our results. Remember, a 1% reduction in U.S. product prices is within the statistical range of error. Nonetheless, we show Perryman’s results in *Figure 4.6.1* and the REMI results in *Figure 4.6.2*.

Perryman	Units	2015	2016	2017	2018	2019	2020
Total Employment	Thousands	250.35	250.35	250.35	250.35	250.35	250.35
Business Sales	2009 \$ (billions)	\$100.14	\$100.14	\$100.14	\$100.14	\$100.14	\$100.14
GDP	2009 \$ (billions)	\$29.05	\$29.05	\$29.05	\$29.05	\$29.05	\$29.05
Personal Income	2009 \$ (billions)	\$16.04	\$16.04	\$16.04	\$16.04	\$16.04	\$16.04
Retail Sales	2009 \$ (billions)	\$5.87	\$5.87	\$5.87	\$5.87	\$5.87	\$5.87

Figure 4.6.1 – These are the results of **Perryman’s** ongoing 1% reduction in fuel prices scenario.⁴⁵ Unlike REMI, Perryman’s input-output model has no dynamic effect (a dynamic effect being a re-estimation of economic impacts from year to year as prices, migration patterns, labor productivity, and business locations change). Hence, we list the numbers as an ongoing, constant impact from year-to-year given the presentation in his data and report.⁴⁶

REMI	Units	2015	2016	2017	2018	2019	2020
Total Employment	Thousands	59.328	63.672	65.906	65.109	62.234	59.578
Business Sales	2009 \$ (billions)	\$9.494	\$10.467	\$11.119	\$11.355	\$11.262	\$11.168
GDP	2009 \$ (billions)	\$5.268	\$5.789	\$6.154	\$6.289	\$6.234	\$6.162
Personal Income	2009 \$ (billions)	\$2.749	\$3.240	\$3.597	\$3.787	\$3.787	\$3.744
Retail Sales	2009 \$ (billions)	\$1.283	\$1.313	\$1.349	\$1.371	\$1.367	\$1.365

Figure 4.6.2 – In **REMI**, the effect of a 1% reduction in fuel prices for households and all private industries has a much less striking result than in Perryman’s study. Additionally, the authors are unclear about how Perryman can perform such a study in a model that is (at its heart) an input-output tabulation. REMI relies on its Cobb-Douglas production function—

⁴⁵ Perryman report, p. 33.

⁴⁶ Ibid.

which quantifies business investment in labor, capital, and fuel types—and its market shares block (which measures national and regional competitiveness for output shares) to determine the effect of a change in input prices. REMI also decreases the prices for households to buy necessary fuel, which leads to an inelastic consumption response and increased spending on other goods. It is difficult to rectify the mammoth differences in the scale of the impact here without more details on Perryman’s model. Nevertheless, given the hidden workings of USMRAIS, the more restrained estimate is the superior one.

While the analytical results differ sharply, we caution that variability in domestic fuel prices is greater than 1%. Hence, the analytical case postulated by Perryman has no empirical support—that is, the results are within a margin of error. Furthermore, their estimates are not close to our independent estimation with the REMI model’s more robust structure for determining cost effects. This is not to say that the effects of fuel price changes are unimportant for the U.S. economy, particularly regarding potential geopolitical disruption of oil supplies in Iran or elsewhere. The REMI results provide a structure to understand how rising transportation fuel prices can affect the ongoing economic recovery.

5. Conclusions

We examined the studies in the “KXL Record” to shed light on the range of economic impacts reported by TransCanada’s economic consultant, the Perryman Group, in contrast to the direct construction corrections discovered by Cornell University’s Global Labor Institute (GLI) and its analysis.

We used the REMI PI⁺ macroeconomic model, which is in use throughout the United States and the world in the area of policy analysis for governments, private firms, foundations, academics, and research institutions.

We list the most salient conclusions from our work as bullet points:

- The Perryman USMRAIS model is opaque—that is, its properties are unknowns to us, and we cannot discover further documentation.
- Using the Perryman Group’s input variables, the REMI model found lower results.

- The GLI corrections as inputs to REMI estimated that KXL construction could produce around 16,000 jobs nationwide for two years, in contrast to the full Perryman estimations of 59,500 national jobs for two years.
- The Ensys analysis, together with the research of Phil Verleger, on KXL suggests that the line will add abundant deliveries of Canadian crude supplies to the Gulf Coast.
- These experts differ on whether Canadian or Arab heavy crude will be surplus to PADD 3 refineries, and which will be redirected to growing crude needs in Asia and in the Middle East for refining into petroleum products.
- Competition among crude suppliers suggests the possibility of lower crude prices for refinery inputs on the U.S. Gulf Coast.
- Lower crude costs will not dictate lower product prices for American consumers because product prices come from a complex interaction of several markets and economic forces.
- Perryman's estimation of 250,000 lasting jobs due to stable crude supplies from KXL to the Gulf Coast cannot find support in the Ensys analysis, in the KXL record, and the differences between crude markets and product markets.
- Perryman provides no analysis to support the claim that Canadian crude will provide a benefit in the form of lower prices for refined products. The Perryman estimation for increase jobs and business activity from a 1% decrease in U.S. domestic fuel prices is mistaken.
- We modeled only economic impacts of construction and operation of KXL, because further crude scenarios are uncertain at this time and their likely economic impacts cannot be pinned-down.
- Gasoline price changes are important to the U.S. economy, particularly regarding potential geopolitical disruption of oil supplies in Iran or elsewhere. The REMI model provides a structure to understand how rising transportation fuel prices can affect the ongoing economic recovery.

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