

ECONOMIC IMPACT OF THE HAYNESVILLE SHALE ON THE LOUISIANA ECONOMY

2009 ANALYSIS & PROJECTIONS FOR 2010-2014



PREPARED BY
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**THE ECONOMIC IMPACT OF THE HAYNESVILLE SHALE
ON THE LOUISIANA ECONOMY IN 2009**

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EXECUTIVE SUMMARY

Much excitement has been created in Louisiana's oil and gas extraction sector by the discovery of the Haynesville Shale deposit in the northwestern part of the state. In Louisiana, it is located primarily in four parishes---Caddo, Bossier, DeSoto, and Red River. What has especially bolstered excitement about this play is the first estimate of its size. One estimate suggests it holds 251 tcf of natural gas, making it the largest natural gas find in the U.S. Some of the initial wells have produced prodigious amounts of natural gas---as high as 24 mmcf/d---though the average decline rate in the first year has been calculated at 80.4 percent.

The purpose of this report is to capture and measure the direct and indirect effects on the Louisiana economy from the activities of the extraction firms operating in the Haynesville Shale in 2009. We received data from seven firms representing about 70 percent of the wells drilled in 2009. On the basis of this large sample, we estimated total expenditures by all firms operating in the shale and plugged these data into the RIMS II model to estimate the annual impacts on: (1) *new sales* for firms in the state, (2) *new household earnings* for residents in the state, (3) *new jobs* in the state, and (4) *tax collections* by the state and local governments.

We can summarize the impacts on the Louisiana economy in the following way:

- We estimate that during the year 2009, the extraction activity of these seven firms generated approximately **\$10.6 billion in new business sales within the state of Louisiana.**
- New business sales in turn created new household earnings for residents of the state. **As a result of these activities, nearly \$5.7 billion in household earnings was created in 2009.**
 - This represents about 3.6 percent of the personal income produced in the state in 2009.
 - Louisiana's personal income actually fell by almost \$1.2 billion or 0.7 percent in 2009. Had it not been for the Haynesville Shale activity the decline would have been 4.3 percent.
 - This estimate includes both direct and indirect earnings and includes almost \$1.3 billion in lease and royalty payments to landowners.
 - There are 64 parishes in Louisiana. In only nine parishes did total personal income exceed \$5.7 billion in 2007. The total personal income in the Monroe MSA (Ouachita and Union Parishes) totaled \$5.4 billion in 2007.

- Including the direct employment of approximately 4,318 employees and contract workers reported by these firms, **there was an increase of 57,637 new jobs within the state in 2009**. The job multiplier is remarkably large in this case due to the fact that \$1.3 billion in lease and royalty payments were injected into the state's economy by the extraction firms.
 - As a reference point, there were 59,500 people employed in all of Louisiana's finance and insurance companies in February 2010.
 - Louisiana lost 38,500 jobs in 2009, a decline of -2 percent. Had it not been for the Haynesville Shale activity, the decline would have been 96,137 jobs or -5 percent.
- Finally, we estimate the increase in state and local tax collections that were generated to extraction activities in the Haynesville Shale. These new taxes came from two sources: taxes paid directly by firms and additional taxes paid by households who experienced an increase in their household earnings via the multiplier effects. Our conservative estimate is that collectively, **state and local tax revenues increased by at least \$912.3 million in 2009** due to the extraction activities in the Haynesville Shale.
 - In Desoto Parish, sales tax collections were up by 82.2 percent in 2009.
 - In Red River Parish, sales tax collections were up 205.1 percent in 2009.
 - In the four primary parishes in which shale operations occurred, sales taxes fell during the short and shallow recession following 9-11. In the much more serious recession of 2009, sales tax collections actually rose in all four of these parishes.

While these multiplier impacts appear large at first blush, it is important to note that a non-trivial amount of the multiplier impacts estimated above did not arise from extraction or drilling activities. Approximately \$1.3 billion of the total expenditures associated with the extraction activity in the Haynesville Shale were in the form of mineral lease payments and royalty payments. Thus, the impacts on business sales, household earnings and jobs arise in no small part from the expenditures made by these lease owners.

One can easily argue that our estimates are on the conservative side, because we are using a very conservative estimate of the percentage of newly created wealth (e.g. lease payments and royalties) that households will spend on goods and services. Based on existing studies, economists estimate that households spend about 5 percent of their wealth each year. But, these estimates are based on traditional measures of household wealth (value of homes, pension values, etc.). The studies do not contemplate massive increases in a household's wealth due to

royalties and lease payments (equivalent in this case to winning the lottery). Unfortunately, we are not aware of any studies that measure the amount of money that households spend from lottery winnings, so we use the 5 percent value to calculate the impacts on sales, earnings and jobs. Thus, the multiplier impacts reported here may be viewed as lower bound estimates. The actual impacts may be substantially larger.

In the addendum, we also estimate the projected impact of Haynesville Shale activity **over 2010-14**. The impacts on business sales, household earnings and jobs are shown in Table E-1:

Table E-1
Projected Economic Impact of Haynesville Shale Activities: 2010-14

Year	Business Sales	Household Earnings	Jobs
2010	\$16,922,746,986	\$4,309,405,111	111,329
2011	\$11,989,513,898	\$3,053,243,027	76,339
2012	\$11,281,082,402	\$2,872,718,682	69,424
2013	\$10,580,655,696	\$2,694,525,036	62,883
2014	\$10,580,655,696	\$2,694,525,036	60,637

The projected impacts on the state and local government treasuries are shown in Table E-2:

Table E-2
Estimated State Taxes: 2010-14

Year	Total Local Taxes	Total State Taxes
2010	\$232,707,876	\$303,738,356
2011	\$164,875,123	\$225,827,012
2012	\$155,126,808	\$225,530,307
2013	\$145,504,352	\$251,206,752
2014	\$145,504,352	\$282,696,752

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I. Introduction

Much excitement has been created in Louisiana's oil and gas extraction sector by the discovery of the Haynesville Shale deposit in the northwestern part of the state. As pointed out by engineer David McGee of Louisiana's Department of Natural Resources, shale is formed where rivers deposit muddy waters over many years. When the water stops flowing a marsh is formed, plants grow and become the source of carbon that is later consumed by bacteria (methanogens), releasing methane. Buried under many feet of other material it is compacted to form a layer of shale with the methane and some water trapped in tiny spaces between the grains.¹

Depth, Location & Size

This shale is found at depths of 10,000 to 14,000 feet and requires horizontal drilling and fracturing of large areas of the formation to release the gas in economical quantities.² This makes the Haynesville Shale gas relatively expensive to produce at \$5 to \$6 million per well. In Louisiana, it is located primarily in four parishes---Caddo, Bossier, DeSoto, and Red River.

What has especially bolstered excitement about this play is the estimate of its size. The Louisiana Department of Natural Resources (LDNR) reports that estimated recoverable natural gas in the play at 251 tcf, which would make the Haynesville Shale the largest onshore gas field in the U.S.

Some of the initial wells have produced prodigious amounts of natural gas. For example, a typical well in the Fayetteville Shale may initially produce 5 mmcf/d, while in

¹ David McGee, "Haynesville Shale Gas Play and Louisiana Coal Seam Natural Gas", Louisiana Department of Natural Resources/Technology Assessment Division, August 2008.

² Ibid.

the Marcellus Shale wells have been hit that produce initially 12 mmcf/d. The **Oil and Gas Journal** reported on a Petrohawk well in Red River Parish producing 28.2 mmcf/d--- a rate more than five times that of the Fayetteville Shale. Petrohawk had another well in Bossier Parish clocking in at 23.4 mmcf/d.³ EXCO Resources has completed two wells in DeSoto Parish yielding initial flow rates of 22.9 mmcf/d and 24.2 mmcf/d, respectively.⁴ It is because of these prodigious flow rates that exploration and production in the Haynesville Shale has continued in early 2009 despite the fact that natural gas prices sometimes dipped below \$4 per mmbtu at the wellhead.

It is important to note that these are *initial* production rates. The average decline rate in the first year on a typical Haynesville Shale well has been estimated by LDNR at 80.4 percent.

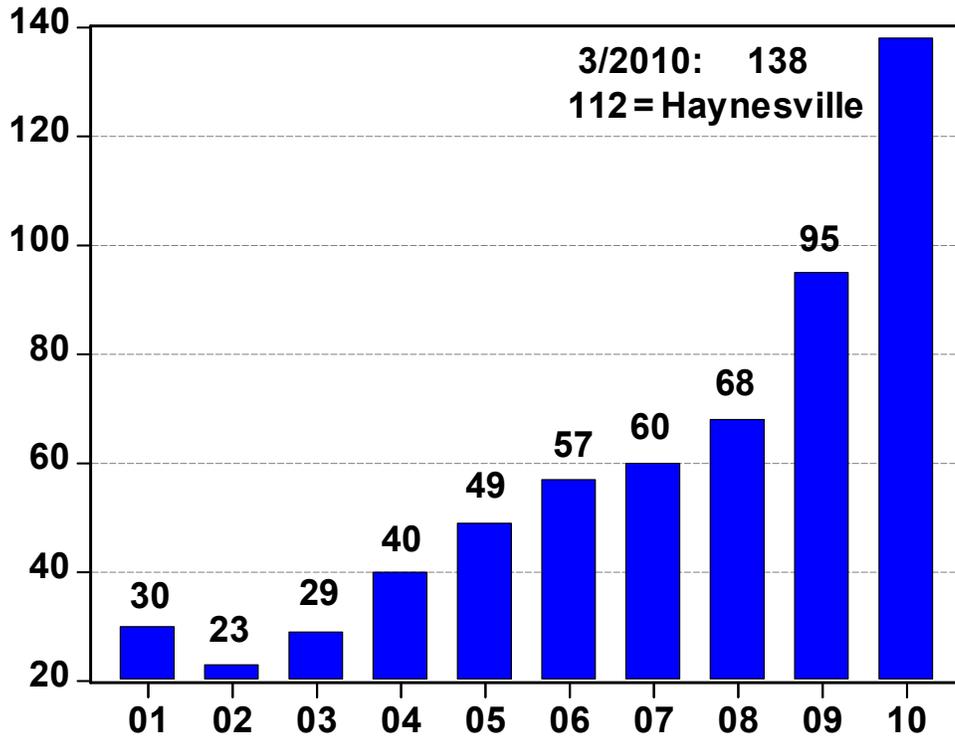
Rig Count Data

Rig count data for the northern part of the state reveal the intensity of interest in the Haynesville Shale (see Figure 1). Between 2004 and 2007 there was an increase in the number of operating rigs from about 39 to 60 due to the overall increase in commodity prices. However, there was another step increase that occurred in 2008 as word about the Haynesville Shale spread. Then in 2009, the count jumped to 95, and in March 2010, it had risen to 138, of which 112 were rigs working the Haynesville Shale.

³ Oil and Gas Journal, website release, December 9, 2008.

⁴ Oil and Gas Journal, March 9, 2009, p. 40.

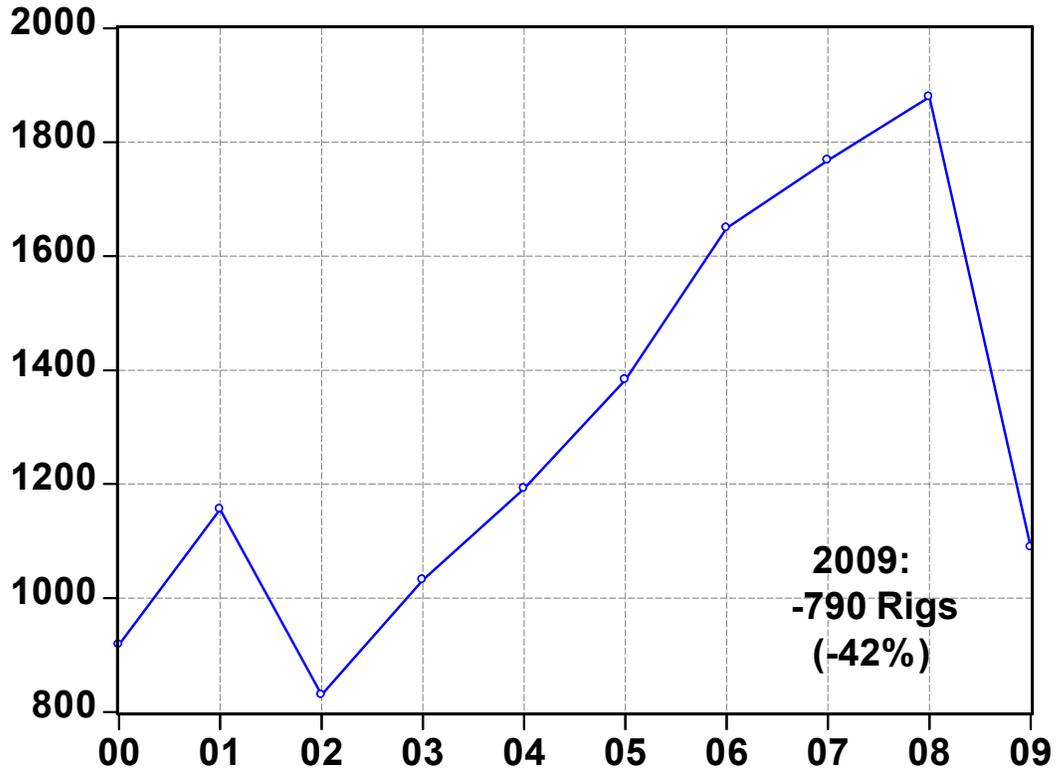
Fig. 1 North Louisiana Rig Count



Source: LA Dept. Natural Resources

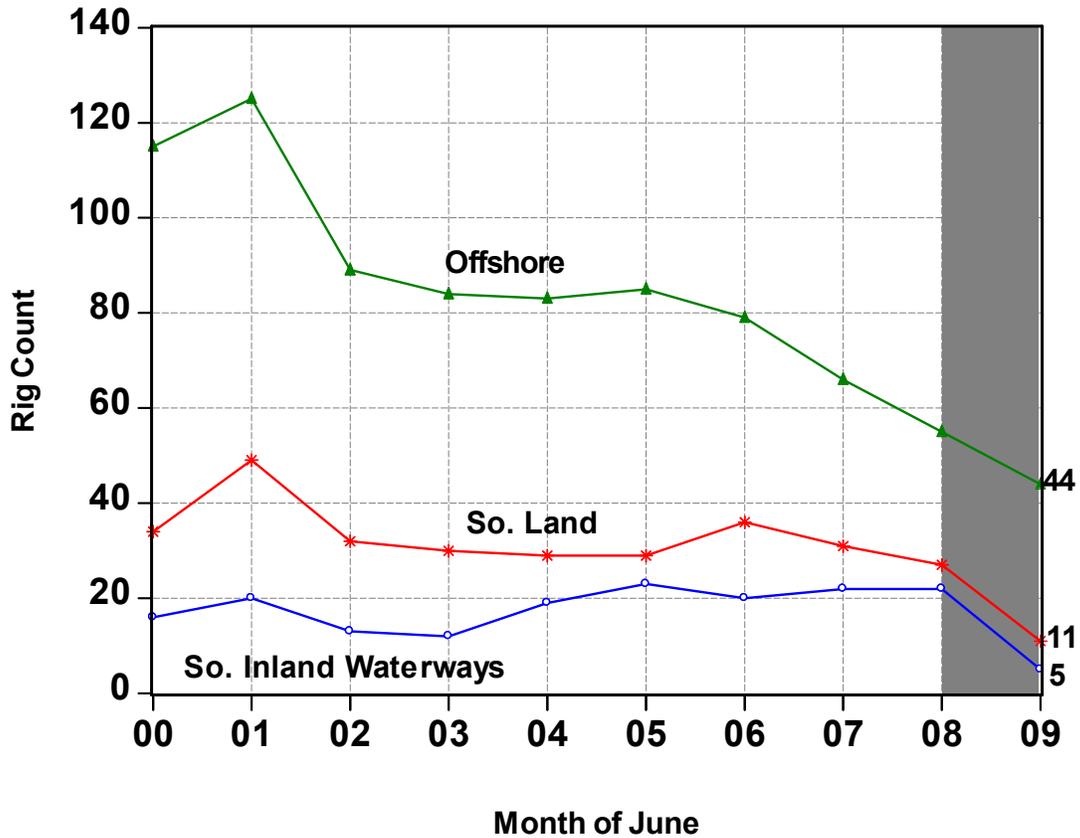
What is really striking is how the North Louisiana rig count compared to what was happening elsewhere in the U.S. and in the state. Note in Figure 2 that in 2009 the U.S. rig count fell by a spectacular 790 rigs or 42 percent. Even in Louisiana there were vast differences in the other areas of the state as shown in Figure 3. The Haynesville Shale activity was crucial to the health of the oil and gas extraction industry in 2009 in Louisiana.

Fig. 2 U.S. Rig Count



Source: Baker Hughes web site

Fig. 3: South Louisiana Rig Counts



Outline of Report

The purpose of this report is to estimate the impact on the Louisiana economy of activities in the Haynesville Shale in 2009. Section II describes the methodology that we use to estimate these impacts. Section III provides the impact estimates on business sales, household earnings, jobs, and tax collections in the state. Section IV provides a summary and conclusions.

II. Methodology

It is a well established principle that business operating decisions have both direct and indirect (multiplier) impacts on the economy.

The Direct Effects

The **direct** impact can be measured by how much new money is injected into the state's economy by activities of firms operating in the shale. In the case of exploration firms, they inject money via lease payments to landowners, monies spent on drilling activities, monies spent on administrative costs associated with operating a firm in the area, and direct taxes paid to governmental entities.

The Questionnaire. To measure these direct impacts we conducted a questionnaire survey of firms that were operating in the Haynesville Shale in 2009. A copy of this questionnaire can be found in Appendix A. This questionnaire was first tested with a few on the participating firms to make sure that questions were clearly stated and that we were asking questions that would capture all the new spending that these firms would be injecting into the Louisiana economy. Several useful suggestions were incorporated into the questionnaire before it was finally emailed to contact persons in each firm. These contact persons were provided by the staff of the Louisiana Oil and Gas Association.

A total of seven firms responded to our questionnaire. These seven firms drilled a little less than 70 percent of the wells in the Haynesville Shale in 2009. Our sample is thus quite large and makes it reasonable to use the replies from this large sample to estimate what all firms operating in the shale spent on the average. We use these data to estimate the impacts of shale activity on the state's economy.

The Multiplier Effect

However, just estimating these direct impacts alone would significantly understate the role of these firms in the economy. The reason is that these firms also buy from, and

sell to, many other firms in the economy. The interactions caused by these purchases and expenditures are magnified by the spending of employees of the extraction firms who earn income from the firms and the affected businesses.

Thus, any change in the activity of a particular firm **indirectly** affects these other buyers and sellers, which in turn affects firms that buy from and sell to these buyers and sellers, etc. For example, when a decision is made by a firm that creates a new job, a chain-reaction is started which works its way throughout the economy. This chain-reaction (**multiplier effect**) causes even more jobs to be created. The analogy is of a rock being tossed into a pond. Not only is there an initial splash (the direct effect), but ripples are created that spread throughout the pond. The purpose of this report is to capture and measure these direct and indirect effects on the Louisiana economy from the activities of the extraction firms operating in the Haynesville Shale.

The Input-Output Table

A major difficulty lies in attempting to quantify these indirect impacts. Fortunately, a technique has been developed for precisely this purpose---an **input-output (I/O) table**. An I/O table is a matrix of coefficients describing the interactions between all industries in a geographical area. The I/O table provides a complete picture of the flows of products and services in an economy for a given year, illustrating the relationship between producers and consumers and the interdependencies of industries in a region.

An I/O table for state has been constructed by the Bureau of Economic Analysis (BEA), U.S. Department of Commerce. The BEA is the government agency responsible for measuring the nation's gross domestic product each quarter. This model is referred to

as the RIMS II model, and is similar to the IMPLAN or REMI models. To find the direct and indirect (spillover) operational effects of particular firm or industry on other firms and workers within a given geographical area, we insert the firm's expenditures into the matrix. In the present case, expenditures provided by the firms operating in the shale are plugged into the RIMS II model to estimate the annual impacts on: (1) *new sales* for firms in the state, (2) *new household earnings* for residents in the state, (3) *new jobs* in the state, and (4) *tax collections* by state and local governments.

III. Impact of Haynesville Shale Activities on the Louisiana Economy

In this section we estimate the direct and indirect impacts on the state's economy resulting from the extraction activities of the firms operating in Haynesville Shale. The estimates reported below represent the impacts for one year---2009. We estimate the impact on business sales, household earnings, and jobs.

The Direct Effects

To get some idea of the magnitude money infusion into the state's economy that was associated with the extraction activity by these firms, Table 1 reports the expenditures on such things as lease and royalty payments, wages and salaries, direct drilling expenditures, administrative expenses, and taxes in 2009.

Note, that in just one year **these firms pumped an amazing \$7.0 billion into the state's economy**. As seen in Table 1, of that \$7.0 billion total, approximately \$957.3 million (14 percent) was accounted for in mineral lease payments with another \$305.9 million in royalty payments. Using the analogy above, this sizable injection of new

money into the Louisiana economy can more appropriately be characterized as tossing a “boulder” into the pond.

Table 1
Annual Expenditures, Taxes and Direct Employment
From Extraction Activity by Firms Operating
In the Haynesville Shale, 2009

Category	Amount
Mineral Lease Payments	\$957,321,967
Royalty Payments	\$305,928,166
Rental & Surface Lease Payments	\$23,119,348
Wages and Salaries	\$52,324,181
Other Administrative Expenses	\$45,395,079
Direct Drilling Expenditures	\$4,441,562,223
Infrastructure Spending	\$975,068,176
Direct Taxes	\$139,473,958
State Taxes	\$41,147,385
Local Taxes	\$35,646,398
Total Expenditures	\$7,016,986,881
Direct Employment	1,299
Contract Employment	3,019
Total Employment	4,318

Source: Survey conducted by author.

Handling of Lease & Royalty Payments

Estimating the impact of the activities of firms operating in the Haynesville Shale on the state’s economy presents researchers with a special problem that is unique to impact analysis. The problem has to do with how one treats the very large lease and royalty payments made to private individuals.

Under normal circumstances, researchers will take all monies spent by a firm in an area and plug that number into an I/O table to generate the indirect impacts on the state economy. However, there is behind that procedure the normal assumption that a

large portion (95 percent +) of the new money received by state residents will be spent. In the case of the \$1.3 billion in lease and royalty payments we are quite confident that this assumption is not true. As an example, we have heard anecdotal evidence of one landowner receiving a check for \$23 million for the right to drill in the Haynesville Shale on his land. Is it reasonable to assume that landowner will spend all \$23 million dollars in one year? The answer is clearly no.

How much will be spent? Perhaps a useful way to approach this is to consider these lease payments (from a spending standpoint) not as income but rather as a sudden increase in wealth. Based on a study by Yash Mehra, he estimates that households spend about 5 percent of their wealth each year.⁵ That would suggest that we insert only 5 percent of the lease and royalty payments into the I/O tables as new spending in 2009.

It is important to note that such a procedure will yield very conservative estimates of lease and royalty payment impacts. This is because Mehra's estimates are based on traditional measures of household wealth (value of homes, pension values, etc.). The studies do not contemplate massive increases in a household's wealth due to royalties and lease payments, which are more equivalent in this case to winning the lottery. Unfortunately, we are not aware of any studies that measure the amount of money that households spend from lottery winnings, so we use the 5 percent value to calculate the impacts on sales, earnings and jobs. Thus, the multiplier impacts reported here may be viewed as lower bound estimates. The actual impacts are likely to be substantially larger.

⁵ Yash Mehra, Federal Reserve Bank of Richmond Quarterly Review, Spring 2001.

Impact of Extraction Activity on Business Sales in Louisiana

Table 2 shows the I/O estimates of the impact of these extraction activities within the Haynesville Shale on new business sales in the state. We estimate that during the year 2009, the extraction activity of these firms generated approximately **\$10.6 billion in new business sales within the state of Louisiana.**

Table 2
Direct and Indirect Impacts on the Louisiana Economy from Extraction Activity
Of Firms Operating in the Haynesville Shale

<i>Item</i>	<i>Impact</i>
New Sales Created	\$10,642,073,930
New Annual Household Earnings Created	\$5,613,164,168*
New Permanent Jobs Created	57,637**

Source: BEA RIMS II Input/Output tables and author's calculations.

* Includes both the direct and indirect impacts. Direct impacts on household earnings includes both wages and salaries and lease and royalty payments from Table 2.

** Includes indirect and direct employment.

The distribution of these additional sales across industries within the state's economy is reported in Table 3. As expected, **the largest impact was experienced by the mining sector (the location of exploration firms), with about \$4.5 billion in new sales during 2009.** Construction firms were also big winners with over \$1 billion in new sales, while firms in the manufacturing sector received \$903.7 million in new sales. Wholesale and retail trade together experienced an increase of about \$737.1 million in new business sales during 2009, which is not surprising given that a non-trivial portion of lease payments going to individuals would be spent in these sectors. According to the

I/O tables, firms in several sectors benefited in a major way from the Haynesville Shale activities.

Table 3
Impact of Extraction Activity by Haynesville Shale Firms on
New Business Sales in Louisiana by Industry

Industry Sector	New Business Sales
Agriculture, forestry, fishing, and hunting	\$43,647,524
Mining	\$4,498,830,390
Utilities	\$166,041,440
Construction	\$1,011,577,206
Manufacturing	\$903,711,056
Wholesale trade	\$317,008,309
Retail trade	\$420,110,091
Transportation and warehousing	\$269,784,988
Information	\$218,280,185
Finance and insurance	\$267,842,025
Real estate and rental and leasing	\$562,377,614
Professional, scientific, and technical services	\$408,092,612
Management of companies and enterprises	\$475,514,935
Administrative and waste management services	\$134,480,398
Educational services	\$68,469,657
Health care and social assistance	\$441,402,972
Arts, entertainment, and recreation	\$55,867,156
Accommodation and food services	\$192,352,166
Other services	\$186,683,207
Total	\$10,642,073,930

Source: BEA RIMS II Input/Output tables and author's calculations.

Impact of Extraction Activity on Household Earnings in Louisiana

These new business sales in turn created new household earnings for residents of the state. The impact on household earnings for Louisiana residents resulting from the extraction activities of firms in the Haynesville Shale is reported in the second row of Table 2. **As a result of these activities, nearly \$5.6 billion in household earnings was created in 2009.** This includes both direct and indirect earnings effects. As reference points for \$5.6 billion:

- This represents about 3.6 percent of the personal income produced in the state in 2009.⁶
- Louisiana’s personal income actually fell by almost \$1.2 billion or 0.7 percent in 2009. Had it not been for the Haynesville Shale activity the decline would have been 4.3 percent.⁷
- There are 64 parishes in Louisiana. In only nine parishes did total personal income exceed \$5.7 billion in 2007 (latest data available). The total personal income in the Monroe MSA (Ouachita and Union Parishes) totaled \$5.4 billion in 2007.⁸

These household income estimates include both direct and indirect earnings. Table 4 documents the indirect household earnings created by Haynesville Shale activities. These indirect earnings (multiplier effect earnings) totaled \$4.3 billion. As shown in Table 4, **the greatest impact on indirect household earnings was experienced by workers in the mining sector, with new household earnings of \$1.7 billion in 2009.** Over \$200 million in new earnings were created for workers in a number of sectors across the state: (1) construction (\$386.1 million); (2) manufacturing (\$304.0 million); (3) management of companies (\$265.4 million); (4) health care (\$245.3 million); and (5) professional, technical and scientific services manufacturing (\$219.2 million). Clearly, there were winners across the board among Louisiana households.

⁶ www.bea.gov/regional/reis.

⁷ Ibid.

⁸ Ibid.

Table 4
Indirect Impact of Extraction Activity by Haynesville Shale Firms on
New Household Earnings for Louisiana Residents by Industry

Industry Sector	New Household Earnings
Agriculture, forestry, fishing, and hunting	\$15,003,095
Mining	\$1,744,629,562
Utilities	\$46,916,890
Construction	\$386,139,836
Manufacturing	\$304,042,697
Wholesale trade	\$144,787,906
Retail trade	\$187,719,285
Transportation and warehousing	\$129,395,944
Information	\$74,837,160
Finance and insurance	\$116,068,443
Real estate and rental and leasing	\$147,038,019
Professional, scientific, and technical services	\$219,244,836
Management of companies and enterprises	\$265,400,894
Administrative and waste management services	\$65,424,747
Educational services	\$39,367,273
Health care and social assistance	\$245,328,470
Arts, entertainment, and recreation	\$27,482,108
Accommodation and food services	\$81,183,835
Other services	\$86,783,687
Total*	\$4,326,794,687

Source: BEA RIMS II Input/Output tables and author's calculations.

* Does not include the direct earnings

Impact of Extraction Activity on Jobs in Louisiana

Using the I/O tables for the region, we can also estimate the impact on new jobs in the state associated with the extraction activities of firms in the Haynesville Shale. New job estimates are reported in the third row back in Table 2. Including the direct employment of approximately 4,318 employees and contract workers in the Haynesville Shale, **there was an increase of 57,637 new permanent jobs throughout the state in 2009.** As a reference point:

- There were 59,500 people employed in all of Louisiana's finance and insurance companies in February 2010.⁹
- Louisiana lost 38,500 jobs in 2009, a decline of -2 percent.¹⁰ Had it not been for the Haynesville Shale activity, the decline would have been 96,137 jobs or -5 percent.

The distribution of the indirect new jobs across industries within the state is reported in Table 5. The new jobs created by the extraction activities in the Haynesville Shale are widely dispersed across industries. Large impacts were felt in construction (10,259), mining (9,310 jobs), retail trade (5,414 jobs), and health care (4,636 jobs).

A careful reader will note that since there were only 4,318 people directly involved in exploration activities by these seven firms, that 53,319 indirect jobs results in a huge job multiplier figure. While this is an unusually large job multiplier, it is important to note that a major part of the multiplier impacts estimated above do not arise from the extraction or drilling activity *per se*. Recall from Table 1 that \$1.3 billion (18.3 percent) of the total expenditures associated with the extraction activity in the Haynesville Shale are in the form of mineral lease, rental, and royalty payments. This means that \$1.3 billion is injected directly into the hands of lease owners. Thus, the impacts on business sales, household earnings and jobs arise in no small measure from the expenditures made by these lease owners.

⁹ Louisiana Workforce at a Glance, March 26, 2010, p. 8.

¹⁰ www.bls.gov.

Table 5
Indirect Impact of Extraction Activity by Haynesville Shale Firms on
New Permanent Jobs in Louisiana by Industry

Industry Sector	New Permanent Jobs
Agriculture, forestry, fishing, and hunting	346
Mining	9,310
Utilities	236
Construction	10,259
Manufacturing	2,087
Wholesale trade	1,660
Retail trade	5,414
Transportation and warehousing	1,713
Information	606
Finance and insurance	1,543
Real estate and rental and leasing	1,301
Professional, scientific, and technical services	2,818
Management of companies and enterprises	2,526
Administrative and waste management services	1,918
Educational services	1,119
Health care and social assistance	4,636
Arts, entertainment, and recreation	645
Accommodation and food services	2,988
Other services	2,193
Total*	53,319

Source: BEA RIMS II Input/Output tables and author's calculations.

* Does not include direct employment.

Alternative Estimates Based on Greater Spending of Lease/Royalty Payments

The impact estimates that we reported in Tables 2-5 are all based on a very important assumption that we discussed back on page 9. That is the assumption that recipients of lease and royalty payments will treat these huge sums of money as a sudden increase in their wealth and will only spent 5 percent of these payments in 2009. We mentioned that the 5 percent figure was based on studies of how much people spend out of traditional sources of wealth, like their homes and equity holdings.

How will lease and royalty recipients think of their newly received wealth? Like a traditional increase in home prices and stock values---leading to a 5 percent withdrawal for spending---or like picking a winning lottery ticket where much more of the sudden increase in wealth is spent?

To illustrate how sensitive our impact estimates are to different assumptions about spending of lease and royalty payments we show in Table 6 what happens to the impact estimates if we assume that lease and royalty payment recipients spent 25 percent of their increase in wealth rather than only 5 percent.

Table 6
Direct and Indirect Impacts on the Louisiana Economy from Extraction Activity
Of Firms Operating in the Haynesville Shale Assuming 5% v. 25% Spending by
Lease and Royalty Recipients

<i>Item</i>	<i>Impact Assuming 5%</i>	<i>Impact Assuming 25%</i>
New Sales Created	\$10,642,073,930	\$10,969,892,328
New Annual Household Earnings Created	\$5,613,164,168*	\$5,708,612,783*
New Permanent Jobs Created	57,637**	60,790**

Source: BEA RIMS II Input/Output tables and author's calculations.

* Includes both the direct and indirect impacts. Direct impacts on household earnings include both wages and salaries and lease and royalty payments from Table 2.

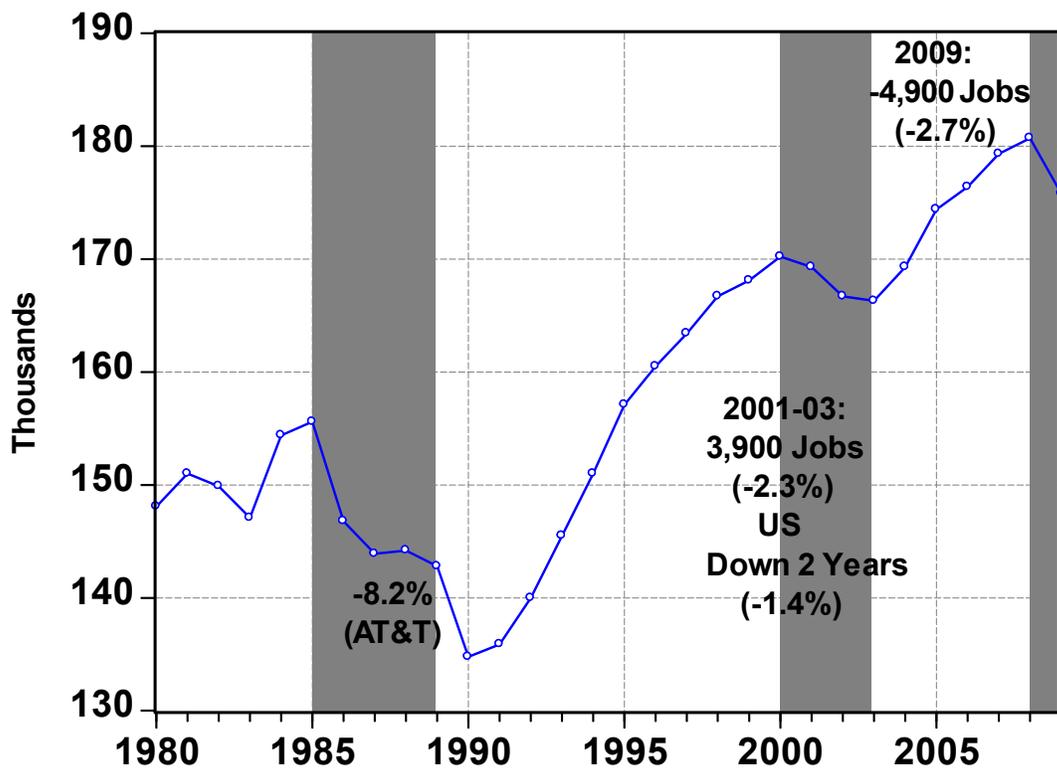
** Includes both direct and indirect jobs created.

Note that the impact on our estimates of this small change in the spending assumption results in a non-trivial boost in our impact estimates. In particular, the job impact jumps from 57,637 to 60,790---a 5 percent increase. Table 6 confirms how sensitive the impact estimates are to our assumptions about spending patterns and also confirms that the estimates we generated in Tables 2-5 are very conservative estimates.

National Recessions and Employment in Northwest Louisiana

Seeing these job impact estimates in Table 6 helps readers understand another interesting phenomenon in the Northwestern area of the state. Figure 4 illustrates the pattern of non-farm employment in the Shreveport-Bossier MSA---defined as Caddo, Bossier, and DeSoto Parishes.

Fig. 4: Shreveport-Bossier MSA Non-Farm Employment 1980-2009



Typically this MSA is the most sensitive area of the state to declines in the national economy. Note for example that during the post 911 national recession in the early 2000s, the very strong impact on this MSA's employment. This was a relatively short and shallow recession for the U.S. economy. Employment fell for only two years

and by only 1.4 percent. By contrast, the Shreveport-Bossier MSA employment (1) fell for three straight years and (2) by -2.3 percent. Also by contrast, during this same period, Louisiana's employment (1) fell in only two years and (2) by only 1.2 percent.

Why does this difference exist in the impact of national recessions in the state as a whole versus the Northwestern corner of the state? When the national economy enters a recession and people either lose their jobs or think they may lose their jobs, the first thing they quit buying are durable goods like autos, appliances, electronics, houses, etc. In the U.S., 6.4 percent of employment is in durable goods, while in Louisiana the comparable figure is only 4.6 percent. Thus, Louisiana firms as a whole are not hit as badly as at the national level. **On the other hand, durable goods employment is 8.2 percent of total employment in the Shreveport-Bossier MSA; thus, this MSA tends to fall harder and longer than the national economy.**

It is here that we see evidence of the Haynesville Shale's powerful influence on this part of the state. The national economy has been losing jobs since January 2008 and lost 6.1 percent of its jobs. Normally, the Shreveport-Bossier MSA would be tracking that pattern, but with even worse results. However, during this national recession, (1) the Shreveport-Bossier MSA's employment actually grew in 2008 in contrast to the U.S. losing jobs every month that year, and (2) the MSA's job losses totaled only -2.7 percent as compared to -6.1 percent at the national level. **Instead of falling harder than the U.S. economy, the Shreveport-Bossier MSA is performing significantly better.**

And this occurred despite the fact that some of the typical durable goods manufacturers in this northwest region were being hammered just as in a normal recession. For example, the local GM plant has completely dropped to only one shift

(now at 798 jobs versus a peak of 3,100). Beaird Industries has closed its 400-worker plants, and Georgia Pacific closed a plywood plant (-280 jobs) and furloughed 400 at another plant in the region. Both Capital One and Verizon have closed call centers (-450 jobs), and casino revenues are down due to the recession. Clearly, the huge sum of money injected into the local economy via the Haynesville Shale activity has spared this MSA from some of the worst effects of the national slowdown.

Impact of Extraction Activity on Government Tax Revenues

Finally, we estimate the increase in state tax collections that were generated by firms due to their extraction activities in the Haynesville Shale. These new taxes came from two sources: (1) taxes paid directly by firms and (2) additional taxes paid by workers in the Haynesville Shale and households who experienced an increase in their household earnings via the multiplier effects.

Direct taxes paid. Table 7 reports both direct taxes paid by companies operating in the Haynesville Shale and our estimate of indirect taxes generated by new household earnings. According to the information provided by these firms, they paid a total of \$216.3 million in state and local taxes that related directly to their extraction activities. The number for state direct taxes is particularly large because it includes severance taxes and royalty, rental, and lease fees paid on natural gas extracted from state-owned lands.

Indirect state taxes collected. Regarding indirect taxes, we have an estimate for both (1) state tax collections and (2) local government collections. We have estimated that earning created by Haynesville Shale activities in 2009 was just under \$5.7 billion. This number is the sum of (1) total indirect household earnings from Table 4, (2) total

wages and salaries paid to extraction firm employees from Table 1, and (3) 5 percent of total lease and royalty payments in Table 1.

Table 7
Additional Taxes Generated by the Extraction Activities of
Firms in the Haynesville Shale, 2009

Category	Amount
Paid Directly:	
State Taxes	\$180,621,343
Local Taxes	\$35,646,398
Indirect Taxes:	
State Taxes Paid by Households	\$392,921,149
Local Sales Taxes Collected	\$303,110,865
Total	\$912,299,755

Source: Survey and author's calculations.

Officials in the State Legislative Fiscal Office estimate that for every dollar of new earnings generated in the state, the state treasury collects about 7.0 cents in sales taxes, income taxes, and other fees. Thus, Haynesville Shale activities indirectly resulted in additional tax revenues for the state of about **\$392.9 million**. Combining this number with the direct taxes paid by these firms (row one of table 7) gives a **total boost to the state treasury in 2009 of \$573.5 million**. As a reference point, in FY09 the state collected \$612.5 million from its corporate income tax.¹¹

Indirect local taxes collected. Dr. James Richardson of LSU's Public Administration Institute has estimated that local governments collect 5.4 cents on every new dollar of earnings generated in the economy. That suggests that Haynesville Shale

¹¹ www.rev.state.la.us

activities indirectly generated \$303.1 million in new revenues for local government coffers in Louisiana. Combining this number with the direct taxes paid by these firms (row two of table 7) gives a **total boost to local government treasuries in 2009 of \$338.7 million**

It is interesting to see how sales tax collections in the parishes directly impacted by the Haynesville Shale activity have behaved---especially compared to the way collections behaved in the last national recession associated with 9-11. This is illustrated by the data in Table 8.

Table 8

Comparative Sales Tax Collections in Selected Parishes

<u>Red River Parish:</u>	<u>Caddo Parish:</u>
2001: -3.1%	2002: -0.8%
2008: 71.1%	2008: 7.0%
2009: 205.1%	2009: 1.4%
<u>DeSoto Parish</u>	<u>Bossier Parish:</u>
FY01: -0.8%	2002: 1.2%*
FY08: 3.6%	2008: 4.1%
FY09: 82.2%	2009: 5.5%

*2002 figure for City of Bossier only

Note from these data that in the previous national recession which was very short (8 months long) and very shallow, that revenues in these parishes---with the exception of a very small gain in Bossier Parish---fell. However, in the recent, very deep, very long recession (deemed the Great Recession by some) sales tax collections in all four parishes rose in both 2008 and 2009, and in Red River and DeSoto Parishes the increases were

spectacular. Clearly, the Haynesville Shale activity has been a real boon for local governments in this part of the state.

IV. Summary and Conclusions

Much excitement has been created in Louisiana's oil and gas extraction sector by the discovery of the Haynesville Shale deposit in the northwestern part of the state. In Louisiana, it is located primarily in four parishes---Caddo, Bossier, DeSoto, and Red River. What has especially bolstered excitement about this play is the first estimate of its size. One estimate suggests it holds 251 tcf of natural gas, making it the largest natural gas find in the U.S. Some of the initial wells have produced prodigious amounts of natural gas---as high as 24 mmcf---though the average decline rate in the first year has been calculated at 80.4 percent.

The purpose of this report is to capture and measure the direct and indirect effects on the Louisiana economy from the activities of the extraction firms operating in the Haynesville Shale in 2009. We received data from seven firms representing about 70 percent of the wells drilled in 2009. On the basis of this large sample, we estimated total expenditures by all firms operating in the shale and plugged these data into the RIMS II model to estimate the annual impacts on: (1) *new sales* for firms in the state, (2) *new household earnings* for residents in the state, (3) *new jobs* in the state, and (4) *tax collections* by the state and local governments.

We can summarize the impacts on the Louisiana economy in the following way:

- We estimate that during the year 2009, the extraction activity of these seven firms generated approximately **\$10.6 billion in new business sales within the state of Louisiana.**

- New business sales in turn created new household earnings for residents of the state. **As a result of these activities, nearly \$5.7 billion in household earnings was created in 2009.**
 - This represents about 3.6 percent of the personal income produced in the state in 2009.
 - Louisiana's personal income actually fell by almost \$1.2 billion or 0.7 percent in 2009. Had it not been for the Haynesville Shale activity the decline would have been 4.3 percent.
 - This estimate includes both direct and indirect earnings and includes almost \$1.3 billion in lease and royalty payments to landowners.
 - There are 64 parishes in Louisiana. In only nine parishes did total personal income exceed \$5.7 billion in 2007 (latest data available). The total personal income in the Monroe MSA (Ouachita and Union Parishes) totaled \$5.4 billion in 2007.

- Including the direct employment of approximately 4,318 employees and contract workers reported by these firms, **there was an increase of 57,637 new jobs within the state in 2009.** The job multiplier is remarkably large in this case due to the fact that \$1.3 billion in lease and royalty payments were injected into the state's economy by the extraction firms.
 - As a reference point, there were 59,500 people employed in all of Louisiana's finance and insurance companies in February 2010.
 - Louisiana lost 38,500 jobs in 2009, a decline of -2 percent. Had it not been for the Haynesville Shale activity, the decline would have been 96,137 jobs or -5 percent.

- Finally, we estimate the increase in state and local tax collections that were generated to extraction activities in the Haynesville Shale. These new taxes came from two sources: taxes paid directly by firms and additional taxes paid by households who experienced an increase in their household earnings via the multiplier effects. Our conservative estimate is that collectively, **state and local tax revenues increased by at least \$912.3 million in 2009** due to the extraction activities in the Haynesville Shale.
 - In Desoto Parish, sales tax collections were up by 82.2 percent in 2009.

- In Red River Parish, sales tax collections were up 205.1 percent in 2009.
- In the four primary parishes in which shale operations occurred, sales taxes fell during the short and shallow recession following 9-11. In the much more serious recession of 2009, sales tax collections actually rose in all four of these parishes.

While these multiplier impacts appear large at first blush, it is important to note that a non-trivial amount of the multiplier impacts estimated above did not arise from extraction or drilling activities. Approximately \$1.3 billion of the total expenditures associated with the extraction activity in the Haynesville Shale were in the form of mineral lease payments and royalty payments. Thus, the impacts on business sales, household earnings and jobs arise in no small part from the expenditures made by these lease owners.

One can easily argue that our estimates are on the conservative side, because we are using a very conservative estimate of the percentage of newly created wealth (e.g. lease payments and royalties) that households will spend on goods and services. Based on existing studies, economists estimate that households spend about 5 percent of their wealth each year. But, these estimates are based on traditional measures of household wealth (value of homes, pension values, etc.). The studies do not contemplate massive increases in a household's wealth due to royalties and lease payments (equivalent in this case to winning the lottery). Unfortunately, we are not aware of any studies that measure the amount of money that households spend from lottery winnings, so we use the 5 percent value to calculate the impacts on sales, earnings and jobs. Thus, the multiplier

impacts reported here may be viewed as lower bound estimates. The actual impacts may be substantially larger.

Appendix A

2009 Louisiana Haynesville Shale Questionnaire

Note: The responses to this questionnaire will be seen only by the staff of Loren C. Scott & Associates, Inc., will not be shared with any other parties, and will be kept strictly confidential. All responses will be reported in aggregate so that confidentiality of individual responses can be maintained. **Please return to us by February 22nd** so we can have the report finished for the March 23rd LOGA meeting. Thanks!

1. How much did your firm pay in mineral lease payments in the Louisiana Haynesville Shale in 2009? _____

2. How much did your firm pay in royalty payments in the Louisiana Haynesville Shale in 2009? _____

3. How much did your firm pay in rental or surface lease payments in the Louisiana Haynesville Shale in 2009? _____

4. How much did your firm pay in direct taxes (severance, royalties, rentals, bonuses, lease) to the State of Louisiana associated with the Louisiana Haynesville Shale in 2009? _____

5. How much did your firm pay in General and Administrative payments in the Louisiana Haynesville Shale in 2009?
Wages & salaries (direct employees and contractors): _____
Utilities: _____
Field Office construction and operating expenses _____
Advertising and Public Relations _____
Community Sponsorships and Donations _____
Other: _____
Total _____

6. How much did your firm spend on direct drilling activities associated with the Louisiana Haynesville Shale in 2009?
Rig expenses (include new build construction expenses if built in Louisiana, contract expenses, and operating expenses) _____
Materials (include pipe, proppant, chemicals, etc. purchased from vendors in Louisiana) _____

Service company expenses (include Louisiana-procured pressure trucking, water trucking, frac / completion services, road and pond construction, trailers, other provisions) _____
Utilities (water, electricity at operational level): _____
State taxes (other than those in question 4): _____
Local government taxes: _____
Other: _____
Total: _____

7. How much did your firm spend on infrastructure activities associated with the Louisiana Haynesville Shale in 2009? (include gathering / pipeline / amine plant construction and operation) _____
8. How many people did you directly employ in Louisiana associated with the Louisiana Haynesville Shale in 2009? _____
9. How many contractors did you employ in Louisiana associated with the Louisiana Haynesville Shale in 2009? _____

Please fax to Loren C. Scott at 225-751-2350. Thanks! If you have any questions please call me at 225-751-1707

ADDENDUM

THE ECONOMIC IMPACT OF THE HAYNESVILLE SHALE OVER 2010-14

I. Introduction & Methodology

In the main body of our report, we used completed questionnaires from firms operating in the Haynesville Shale to estimate the impact of these activities on the Louisiana economy in 2009. In this addendum, we attack a much more difficult issue: what will be the impact on the Louisiana economy of activities in the Haynesville Shale over the next 5 years? To generate this estimate, we must essentially estimate what the answers to the questions in Appendix A will be at the end of each year from 2010-14.

Estimating Projected Drilling Expenses

To generate these estimates, we rely to no small degree on projections already performed by staff in the Department of Natural Resources (DNR). For example, these staff have estimated the total number of wells expected to be drilled in the shale each year over 2010-14. However, since DNR generated these estimates, we are aware that many firms operating in the shale have begun to reduce their drilling plans a bit in order to (1) move to areas where drilling costs may be a bit cheaper and (2) where drilling may also generate oil production (there is no oil production associated with Haynesville wells). We have reduced DNR's well estimates based on how many rigs are presently operating in the shale and on the planned reduction in drilling activity scheduled for 2011. Our estimated well count is shown in column 2 of Table A-1.

DNR also collects data on how much it cost to drill a well in the shale on the average--- \$9,884,978.84 (column 3). Thus, we can estimate in column 4 total drilling expenses per year over 2010-14, which is the answer to question #6 on the questionnaire-

--total drilling expenses. As can be seen, these drilling expenditures are quite substantial, ranging from a high of \$7.1 billion in 2010 to a low of \$4.4 billion in 2013-14. The 2010 figure of \$7.1 billion is important, because it suggests drilling spending in 2010 will be 61 percent higher than in 2009, which means the estimated impacts of the Haynesville Shale activity should be much higher for 2010 as compared to 2009.

Table A-1

Estimating Total Drilling Expenses Over 2010-14

Year	Wells Drilled	Cost Per Well*	Total Drilling Costs
2010	720	\$9,884,978.84	\$7,117,184,765
2011	510	\$9,884,978.84	\$5,041,339,208
2012	480	\$9,884,978.84	\$4,744,789,843
2013	450	\$9,884,978.84	\$4,448,240,478
2014	450	\$9,884,978.84	\$4,448,240,478

* DNR staff estimates

Estimating Administrative, Infrastructure, and Direct Employment

The data in the last column of Table A-1 were then allocated across various categories in question #6 in the same proportion that firms reported these data when responding to the 2009 questionnaire. Similarly we assume (a) that General and Administrative costs in question #5 and infrastructure spending in question #7 on the questionnaire will occur in the same proportion to drilling expenses as they did in 2009 and (b) that direct employment (question #8 and #9) will be in direct proportion to drilling expenses as they did in 2009.

Estimating Royalty Payments

We also need to estimate how much these firms will pay out in royalty payments over 2010-14---question #2 on the questionnaire. To generate this estimate, we need (1)

an estimate of total production out of the shale, (2) the price per mcf of the natural gas, and (3) the royalty rate. Table A-2 contains our estimates of each.

For total production we began with DNR’s staff estimates of total production over 2010-14. That estimate, however, was based on wells drilled that we mentioned above were likely much too optimistic given the reduction in activity announced by firms recently. We reduced DNR’s production estimate in the same proportion that we reduced the well activity in each of the years over 2010-14. That gives us the production estimates shown in column 2 of Table A-2.

We then had to multiply this production estimate by the projected price per mcf of natural gas over 2010-14. Anyone in the industry knows this is a very tricky endeavor. We decided to use the change in the futures price of natural gas as of mid-April 2010 as our model for estimating the trends in the wellhead price of natural gas going forward. We recognize that the future’s price is not always an accurate measure of actual future prices, but it is at least based on estimates by people and institutions that are putting their money on the line. These price estimates are shown in column 3 of Table A-2.

Table A-2

Estimating Royalty Payments Over 2010-14

Year	Production (mcf)	Price Per mcf	Estimated Value of Production	Estimated Royalty Payments
2010	52,973,383	\$4.00	\$211,893,532	\$52,973,383
2011	53,663,881	\$4.56	\$244,661,697	\$61,165,424
2012	69,271,846	\$5.21	\$360,906,318	\$90,226,579
2013	139,735,831	\$5.58	4779,725,937	\$194,931,484
2014	185,708,383	\$5.88	\$1,091,965,292	\$272,991,323

We then estimated total royalty payments by multiplying the estimated value of production by 25 percent---the typical royalty rate in the shale play. Total royalty payments by year are shown in the last column of Table A-2. Unfortunately, we have been unable to determine how much of the shale production is from state-owned versus privately-owned land, so we are unable to determine how much of the royalty payments end up in the state treasury. As in our impact estimates for 2009, we assumed that only about 5 percent of these royalty payments would be spent in the year they were paid.

Estimating Lease Payments and Severance Taxes

Finally, we have to estimate total severance taxes and lease payments that will be made by the operating companies over 2010-14 (questions 1, 3, and 4 on the questionnaire). These are shown by year in Table A-3.

Table A-3

Estimated Severance Taxes and Lease Payments: 2010-14

Year	Estimated Severance Taxes	Estimated Lease payments
2010	\$2,080,000	\$20,000,000
2011	\$12,100,000	\$15,000,000
2012	\$24,440,000	\$10,000,000
2013	\$62,590,000	\$7,500,000
2014	\$94,080,000	\$5,000,000

Staff at DNR had already generated estimates of severance tax collections from the shale over 2010-14. Those estimates, however, was based on wells drilled that we mentioned above were likely much too optimistic given the reduction in activity announced by firms recently. We reduced DNR’s severance tax estimate in the same proportion that we reduced the well activity in each of the years over 2010-14. The resulting estimates are shown in column 2 of Table A-3. This figure starts off relatively

low at \$2.08 million because severance tax rules allow exemption from severance taxes in the first two years (up to the cost of drilling the well) when the wells are horizontally drilled, as those in the Haynesville Shale are. Note that severance tax collections pick up markedly starting in 2012 and grow to over \$94 million in 2014.

Estimating lease payments over the next 5 years is highly judgmental. Lease activity tends to be furious in the first couple of years in a play, and then it tends to drop off markedly. For example, in 2008 lease payments were in excess of \$3.2 billion. In 2009, these payments fell substantially to \$957 million. As seen in Table A-3, we are taking what we believe to be a conservative position and have lease payments falling from a high of only \$20 million in 2010 to \$5 million in 2014.

**II. The Economic Impacts Over 2010-14:
Business Sales, Household Earnings & Jobs**

The expenditure data derived from the assumptions above were plugged into the Louisiana input-output table to determine the impact on business sales, household earnings, and jobs within the state. The results are documented in Table A-4.

Table A-4

Projected Economic Impact of Haynesville Shale Activities: 2010-14

Year	Business Sales	Household Earnings	Jobs
2010	\$16,922,746,986	\$4,309,405,111	111,329
2011	\$11,989,513,898	\$3,053,243,027	76,339
2012	\$11,281,082,402	\$2,872,718,682	69,424
2013	\$10,580,655,696	\$2,694,525,036	62,883
2014	\$10,580,655,696	\$2,694,525,036	60,637

Clearly, the shale activity will be having a marked impact on the Louisiana economy over the next five years. Because the number of wells drilled over this 5-year period is projected to be significantly greater than in 2009, and because more of the

expenditures will be in the job-rich drilling expenditures category, the impacts are noticeably greater than in 2009. Note that sales in Louisiana businesses will jump by \$16.9 billion in 2010 and fall gradually to about \$10.6 billion in 2014. Louisiana households will see their earnings rise by \$4.3 billion in 2010 and decline to a still hefty \$2.7 billion in 2014. Jobs supported runs from a high of 111,329 in 2010 to 60,637 in 2014. By any measure these are very big impacts on the state's economy.

II. The Economic Impacts Over 2010-14: State and Local Revenues

Assuming the impacts in Table 4 are near the mark, we can also roughly estimate how much Haynesville Shale activity will impact **state government revenues**. This is done in Table A-5.

Table A-5

Estimated State Taxes: 2010-14

Year	Estimated Severance Taxes	Indirect Taxes	Total Taxes
2010	\$2,080,000	\$301,658,356	\$303,738,356
2011	\$12,100,000	\$213,727,012	\$225,827,012
2012	\$24,440,000	\$210,090,307	\$225,530,307
2013	\$62,590,000	\$188,616,752	\$251,206,752
2014	\$94,080,000	\$188,616,752	\$282,696,752

Not surprisingly, the state treasury gains heartily from the shale activity. It picks up revenues from three sources. First there are the direct **severance tax payments** shown in the second column of table A-5. We first referenced these severance taxes back in Table A-3. These are based off of DNR estimates of severance taxes, but we ratioed those estimates down based on a lower number of wells drilled compared to the initial DNR estimates. Note that severance collections start off relatively low at \$2.08 million

because severance tax rules allow exemption from severance taxes in the first two years (up to the cost of drilling the well) when the wells are horizontally drilled, as those in the Haynesville Shale are. Then, as that exemption expires, severance taxes began to grow rapidly to a high of over \$94 million in 2014.

Secondly, we illustrated back in column three of Table A-4 that the shale activity generates a substantial amount of new income for Louisiana households. Officials in the Legislative Fiscal Office have estimated that for every \$1 of new earnings created in the state, the state treasury collects an additional seven cents in new revenues from income taxes, sales taxes, gasoline taxes, fees, etc. We multiply the new household earnings data in column three of Table A-4 times 0.07 to arrive at the **indirect taxes** generated for the state treasury that are shown in column three of Table A-5.

There is a third important source of revenues for the state treasury that we were, unfortunately unable to estimate---**royalties** from natural gas lifted from state-owned lands in the Haynesville Shale play. We were unable to find information on what share on the Haynesville Shale activity was on state-owned lands or water-bottoms.

Thus, our final estimate of the impact on the state treasury is a very conservative one because it omits the royalty payments. This final estimate is shown in the last column of Table A-5. These collections range from a high of \$303.7 million in 2010 to a low of \$225.5 million in 2012. The projected collection stream is “U-shaped” because indirect tax revenues start out high and then decline as the well count declines, while severance taxes start out low and then accelerate over time.

We can also generate a conservative estimate of the impact of the shale activity on local government treasuries. Dr. James Richardson has estimated that for every dollar of new

household income created in Louisiana, local government collections rise by 5.4 cents. If we take the estimates of new household earnings back in column three of Table A-4 and multiply them times 0.054 we arrive at the **indirect taxes** generated for local government treasuries that are shown in Table A-6. These collections rise from a peak of \$232.7 million in 2010 to a low of \$145.5 million in 2014. Clearly, the discovery of the shale has been a boon to local governments and is projected to continue to be so.

Table A-6

Impact on Local Government Revenues: 2010-14

Year	Collections
2010	\$232,707,876
2011	\$164,875,123
2012	\$155,126,808
2013	\$145,504,352
2014	\$145,504,352

