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**SHale gas**  
**Exploration and**  
**Exploitation induced**  
**Risks**

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# **Comparison of socio-economic impacts of conventional and unconventional sources**

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# Economic impacts of shale gas development

## Positive impacts

- Increase in employment rates;
- Increase in incomes (wages and salaries, royalties payments).

**Effects of fracking on wages and salaries by industry**  
**Effects of fracking on employment by industry**

	(1) Total	(2) Mining	(3) Transport	(4) Construct	(5) Leisure	(6) Financial	(7) Local Gov	(8) Other
Panel B: IV								
County	65,817*** (7,642)	23,743*** (6,316)	15,561*** (3,561)	9,245*** (1,763)	1,894*** (388)	1,785*** (496)	1,573* (838)	12,017** (5,389)
County +100 miles	243,210*** (18,208)	105,036*** (13,045)	62,643*** (4,975)	36,229*** (2,971)	6,079*** (536)	7,449*** (1,607)	3,925*** (1,210)	13,615*** (2,744)
State	343,350*** (49,008)	119,566*** (14,114)	74,932*** (5,544)	67,742** (30,987)	11,510*** (3,769)	9,279** (3,830)	6,836** (3,109)	53,485*** (6,603)

Source: Feyerherm et al. (2015)

Employment increase for each million dollar of additional production is equal to 0.78 at county level.

One million dollar is associated with 66,000 \$ additional wage at county level . The county impact within 100 miles are over three times as large as the county in itself, 24,000\$ in the mining sector. Results are referred to each million dollar of new production.

**Two third of the increase related to the mining and transport at state level and closer to the state results**



# Economic impacts of shale gas development

## Negative impacts

- **Effects on housing prices**

- Affected mainly by fear on surface and groundwater contamination

*In most studies effects are negative, but in some others positive effects on housing prices mainly due to royalties have been put in evidence*

- **Effects on health**

- ✓ healthcare expenses → headaches, throat, eye irritation, lung disease, Asthma attacks related to shale gas boom

- **Effects on people safety**

- ✓ Increase in crimes rates;
  - ✓ Increase in traffic accidents

# Economic Impact of the exploitation of conventional hydrocarbons

## ***Effects deriving from:***

***Direct impact*** → jobs, labor income, and value added within the oil and natural gas industry.

***Indirect impact*** → jobs, labor income, and value added occurring throughout the supply chain of the oil and natural gas industry.

***Induced impact*** → the jobs, labor income, and value added resulting from household spending of labor and proprietor's income earned either directly or indirectly from the oil and natural gas industry's spending

# Economic Impact of the exploitation of conventional hydrocarbons

## Total Operational and Capital Investment Impacts of the Oil and Natural Gas Industry on the US Economy, 2011

### Total Impacts of the Oil and Natural Gas Industry's Operations in 2011

#### Top 15 States, Ranked by Employment Share of State Total

State	Employment*		Labor Income**		Value Added	
	Amount	Percent of State Total	(\$ Million)	Percent of State Total	(\$ Million)	Percent of State Total
Wyoming	80,000	20.4%	\$5,134.7	21.3%	\$13,018.7	32.9%
Oklahoma	364,300	16.8%	\$23,297.9	22.9%	\$39,001.9	23.1%
Louisiana	412,600	16.2%	\$24,213.4	19.4%	\$73,925.4	35.5%
Texas	1,938,700	13.6%	\$144,085.3	18.7%	\$308,346.0	23.2%
North Dakota	64,000	12.0%	\$3,831.4	13.1%	\$6,575.1	12.3%
Alaska	56,600	11.9%	\$4,501.6	12.6%	\$19,277.0	34.7%
New Mexico	105,600	9.9%	\$5,350.1	10.3%	\$11,273.6	14.2%
West Virginia	80,400	8.9%	\$3,638.6	8.8%	\$5,756.1	8.7%
Kansas	148,300	8.1%	\$7,211.1	8.6%	\$12,902.8	9.5%
Montana	43,100	6.7%	\$2,009.3	7.7%	\$4,546.7	10.8%
Colorado	213,100	6.7%	\$14,087.6	8.1%	\$25,811.3	9.1%
Mississippi	97,800	6.6%	\$4,526.1	7.4%	\$9,055.3	9.4%
Arkansas	92,500	5.9%	\$4,220.3	6.3%	\$8,062.7	7.8%
Utah	79,600	4.9%	\$4,091.5	5.3%	\$8,376.7	6.9%
Pennsylvania	339,000	4.7%	\$19,550.5	5.1%	\$34,654.3	5.8%
Labor Income (\$ millions)**			\$597,615	6.3%		
Value Added (\$ millions)			\$1,209,389	8.0%		

Source: PWC report for American Petroleum Institute



# Economic Impact of the exploitation of conventional hydrocarbons

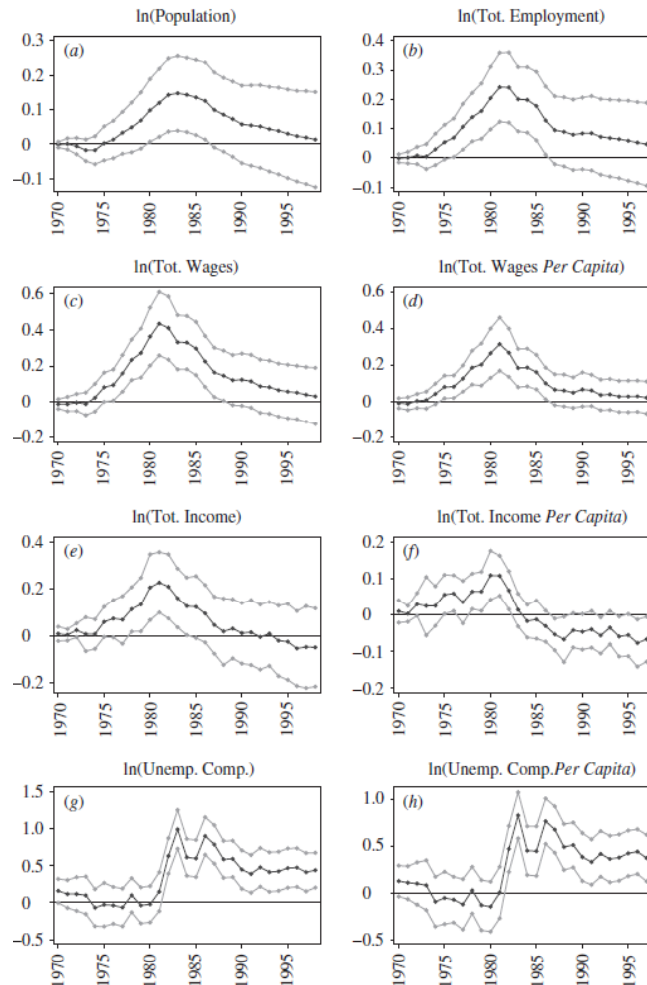
## Total Operational Impact of the Oil and Natural Gas Industry By State in 2011

State	Employment		Labor Income		Value Added	
	Amount	Percent of State Total	(\$ Million)	Percent of State Total	(\$ Million)	Percent of State Total
Alabama	673,300	4.1%	\$4,908.9	4.2%	\$2,457.8	3.7%
Alaska	56,600	11.9%	\$4,501.6	12.6%	\$19,277.0	34.7%
Arizona	77,000	3.0%	\$4,654.4	3.0%	\$9,016.6	3.4%
Arkansas	213,200	5.7%	\$4,220.3	6.3%	\$8,062.7	7.8%
California	793,200	4.1%	\$58,883.6	4.9%	\$131,445.1	6.7%
Colorado	213,100	6.7%	\$14,087.6	8.1%	\$25,811.3	9.1%
Connecticut	59,400	2.7%	\$4,160.4	2.8%	\$7,683.0	3.3%
Delaware	16,100	3.0%	\$957.4	3.2%	\$1,965.6	4.1%
District of Columbia	13,700	1.7%	\$1,426.6	1.3%	\$2,702.6	1.9%
Florida	286,800	2.9%	\$12,918.6	2.8%	\$23,154.0	3.1%
Georgia	141,600	2.7%	\$6,765.0	2.5%	\$12,902.3	3.0%
Hawaii	20,500	2.3%	\$1,036.4	2.0%	\$2,167.2	2.9%
Idaho	27,000	3.1%	\$1,041.0	2.9%	\$1,796.9	3.1%
Illinois	263,700	3.6%	\$15,744.6	3.8%	\$33,307.9	5.1%
Indiana	136,400	3.8%	\$6,699.1	4.1%	\$16,595.7	6.3%
Iowa	65,100	3.3%	\$2,568.0	3.0%	\$4,419.0	3.1%
Kansas	148,300	8.1%	\$7,211.1	8.6%	\$12,902.8	9.5%
Kentucky	94,700	4.0%	\$4,054.0	3.8%	\$7,867.8	4.6%
Louisiana	412,600	16.2%	\$24,213.4	19.4%	\$73,925.4	35.5%
Maine	28,800	3.6%	\$1,150.2	3.2%	\$2,370.5	4.2%
Maryland	75,400	2.2%	\$4,190.0	1.9%	\$7,084.8	2.2%
Massachusetts	106,300	2.5%	\$7,117.9	2.6%	\$12,638.9	2.9%
Michigan	182,000	3.6%	\$8,807.8	3.5%	\$15,761.3	4.1%
Minnesota	122,100	3.5%	\$6,018.2	3.4%	\$14,305.7	5.0%
Mississippi	97,800	6.6%	\$4,526.1	7.4%	\$9,055.3	9.4%
Missouri	118,800	3.4%	\$5,527.1	3.3%	\$9,810.9	3.8%
Montana	43,100	6.7%	\$2,009.3	7.7%	\$4,546.7	10.8%
Nebraska	47,200	3.8%	\$2,687.4	4.7%	\$4,722.2	5.4%
Nevada	48,600	3.2%	\$2,432.7	3.2%	\$4,539.9	3.8%
New Hampshire	24,900	3.0%	\$1,252.7	2.8%	\$2,250.3	3.3%
New Jersey	143,900	2.9%	\$10,123.7	3.3%	\$19,875.5	4.0%
New Mexico	105,600	9.9%	\$5,350.1	10.3%	\$11,273.6	14.2%
New York	270,600	2.4%	\$20,419.4	2.7%	\$35,196.8	3.0%
North Carolina	146,100	2.8%	\$6,763.6	2.6%	\$12,479.2	3.0%
North Dakota	64,000	12.0%	\$3,831.4	13.1%	\$6,575.1	12.3%
Ohio	255,100	3.9%	\$12,744.4	4.1%	\$28,444.7	5.7%
Oklahoma	364,300	16.8%	\$23,297.9	22.9%	\$39,001.9	23.1%
Oregon	60,400	2.8%	\$2,811.2	2.8%	\$5,027.0	3.0%
Pennsylvania	339,000	4.7%	\$19,550.5	5.1%	\$34,654.3	5.8%
Rhode Island	15,100	2.5%	\$934.4	2.8%	\$1,650.0	3.2%
South Carolina	67,700	2.9%	\$2,634.2	2.4%	\$4,672.8	2.8%
South Dakota	22,500	3.9%	\$857.0	3.5%	\$1,459.0	3.9%
Tennessee	111,500	3.2%	\$5,086.1	3.0%	\$8,918.5	3.4%
Texas	1,938,700	13.6%	\$144,085.3	18.7%	\$308,346.0	23.2%
Utah	79,600	4.9%	\$4,091.5	5.3%	\$8,376.7	6.9%
Vermont	14,600	3.6%	\$567.0	3.1%	\$1,042.2	3.6%
Virginia	141,600	3.0%	\$7,215.2	2.5%	\$12,460.6	2.9%
Washington	104,300	2.8%	\$5,908.4	2.7%	\$14,004.8	4.0%
West Virginia	80,400	8.9%	\$3,638.6	8.8%	\$5,756.1	8.7%
Wisconsin	103,300	3.0%	\$4,557.1	2.9%	\$7,901.5	3.1%
Wyoming	80,000	20.4%	\$5,134.7	21.3%	\$13,018.7	32.9%
<b>U.S. Total</b>	<b>8,445,200</b>	<b>4.9%</b>	<b>\$515,368.0</b>	<b>5.4%</b>	<b>\$1,073,552.3</b>	<b>7.1%</b>



# Economic Impact of the exploitation of conventional hydrocarbons

## Are those positive effects long lasting?



Source: Jacobsen et al

Some activities faced a reduction of dimension during the boom → Dutch disease → decrease of 3000 dollars per year in farmer's income.



# Negative effects of conventional hydrocarbons extraction

On- and off-shore exploration, drilling, and extraction activities are inherently invasive and affect ecosystems, human health, and local cultures.

Major impacts:

- Environmental negative impacts;
- long-term harm to animal populations (particularly migratory birds and marine mammals),
- human health and safety risks for neighboring communities and oil industry workers
- Social disorganization, economic inequality and increase in crime rates

**The situation is worse in the developing countries**



# Environmental negative impacts

## Negative impact on fisheries of off-shore O&G exploitation

### **The Prestige accident**

On November 19<sup>o</sup> 2002, the oil spill Prestige polluted thousands of kilometers of coastline, causing damages to the Galician community the most part employed in the fishing sector.

The economic loss suffered in 2003 (the year after the accident) was estimated to be **€56 million in relation with fishing and €9 million for the aquaculture activities. The reduction of production was calculated to be 10% while income decreased more than 17%. This difference was attributed to the loss of consumer confidence on the quality of the produce**

# Health diseases

## The case of the San Carlos Village, north east Ecuador

*Cases of cancer found in the village of San Carlos, Orellana, 1989–98*

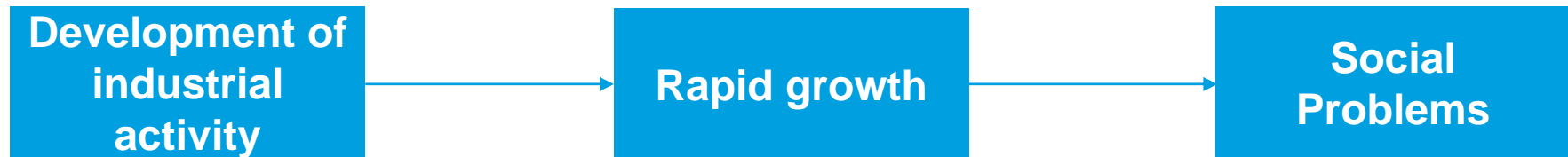
<i>Sex</i>	<i>Type of cancer</i>	<i>Date of diagnoses</i>	<i>Age at diagnoses</i>	<i>Date of death</i>	<i>Duration of residence in San Carlos (y)</i>
M	Ampulla of Vater†	March 89	68	July 89	22
M	Stomach	June 91	64	92	20
M	Stomach	August 92	55	September 92	15
M	Stomach	June 97	65	October 98	16
M	Larynx	September 97	46	—	
M	Liver	August 98	86	September 98	26
M	Melanoma	November 96	52	August 97	15
M	Leukaemia‡	July 93	5	—	7
F	Lymphoma§	96	28	April 99	16
F	Cervix	May 98	52	—	30

Source: San Sebastián et al.

San Carlos is a small village of 1000 in 1998. Water analysis showed severe exposure to TPHs (total petroleum hydrocarbons) by the residents. An overall excess for all types of cancer was found in the male population *with a risk 2.26 times observed excess of cancer* might be associated with the pollution of the environment by toxic contaminants coming from the oil production.

# Social problems arising from rapid economic development

In boomtowns the increase of industrial activities leads to increase in immigration and growth which affects social problems



## Economic inequality & Social disorganization

# Social disorganization & Economic inequality

## Social disorganization mechanism

Rapid growth → massive immigration → increase in suspicion and decrease in surveillance → increase in crime rates

## Economic inequality mechanism

Relative Means of Social Problems by Activity and Degree of Involvement or people benefitting from the economic development → frustration → increase in crime rates

States	Price	Low	Increasing	Decreasing	Low	F	R <sup>2</sup>
		(1956-1973)	(1974-1981)	(1982-1985)	(1986-1990)		
L. Suicide Rates	10.02	10.39	10.99	11.88	11.70***	.807	
M. Suicide Rates	7.59	10.39 <sup>a</sup>	11.70 <sup>a</sup>	13.68 <sup>a</sup>	15.67***	.610	
H. Homicide Rates	5.82	10.13 <sup>a</sup>	8.96 <sup>a</sup>	8.80	11.31***	.539	
M. Homicide Rates	9.79	11.52	11.79	8.15	1.96	.168	
H. Juvenile Commit.	33.49	38.04	37.89	63.71	3.73	.615	
M. Juvenile Commit.	46.67	40.75	29.63	98.33 <sup>abc</sup>	12.45**	.842	
H. Criminal Cases	64.63	91.16 <sup>a</sup>	111.18 <sup>a</sup>	96.85 <sup>a</sup>	16.28***	.720	
M. Criminal Cases	53.75	97.43 <sup>a</sup>	125.45 <sup>a</sup>	102.56 <sup>a</sup>	18.37***	.744	
U.S. Suicide Rates	10.93	12.43 <sup>a</sup>	12.25 <sup>a</sup>	12.63 <sup>a</sup>	23.11***	.705	
U.S. Homicide Rates	6.24	9.89 <sup>a</sup>	8.73 <sup>a</sup>	8.90	12.89***	.571	

The state of Louisiana is a concrete example of long term negative effects of exploration and extraction of natural resources. The local dependence on oil extraction cost thousands of local jobs in the last years and also the rise in crime rates increasing drilled wells.

Source: Seyditz et Laska



# Positive or negative effects of exploitation of conventional and unconventional hydrocarbons different?

- Positive effects on labour and income are evident in the short run for activities closely connected with exploration and exploitation activities;
- Increase in crimes as effect of the boom, lasting also in the bust period for conventional hydrocarbons;
- Health diseases concerns are the same, but effects of shale gas on health are not possible to evaluate, as the time interval is too short.

## Summing up:

- Shale gas is at its early stage, so effects in the long run are difficult to be pointed out;
- Each kind of energy source generates potential risks and social disorders → NIMBY effect with wind energy;
- Positive effects in the short run are evident for both shale and conventional hydrocarbons activities, but there are also negative effects for conventional hydrocarbons in the long run.