



Fossil Fuels, Foreign Trade, and Foreign Investment in the American West

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Cover photographs

(Clockwise from top left) Oakland harbor, Texas oil pump, oil platform off Santa Barbara, mine near Lead, SD, container port at Long Beach, Calif. (Credits: Sara Tollefson, Flickr user DJ Linda Lovely, Flickr user Travis S., Flickr user Wayoutwestnews, Flickr user Konabish)

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Executive Summary

The American West has long been the major fossil fuel producing region of the United States. This fact is lost upon many Americans, who live far removed from rural areas in the American West where the energy that supports their lives is derived. This working paper policy brief sets out to examine fossil fuel production in the American West in the context of the global economy. Specifically this brief intends to examine how foreign countries and foreign corporations influence fossil fuel production in the American West. The brief examines direct foreign influence in the American West in the form of investment and indirect foreign influence in the form of demand for fossil fuels.

The research in this policy brief shows that direct foreign investment in the fossil fuel industry in the American West is minimal. Indirect foreign influence is the force that has the greatest impact on fossil fuel production in the American West. This indirect influence in the form of demand for fossil fuels has led to price increases that affect the fossil fuel industry in the American West fossil fuel industry, but this has not increased exports. The paper concludes that this price pressure is likely to continue, but that massive American domestic demand will continue to be the central factor in determining the rate of fossil fuel production in the American West.

Introduction

The United States' economy is heavily dependent on fossil fuels: coal, natural gas, and oil. Most contemporary discussion of American fossil fuel use centers on the country's dependence on the importation of foreign oil, which has been the subject of economic policy analysis since the American oil crises that bookended the 1970s.¹ While the fervor of this narrative suggests that almost all of America's carbon energy is procured beyond its borders, this is incorrect. In 2010, 71 percent of fossil fuel energy consumed in the United States was produced domestically.² Most of this fuel production happens in rural America, especially in the eighteen western states that straddle or sit to the west of the fabled 100th meridian. However, since almost 80 percent of Americans live in urban centers, many remain unaware that the rural West serves as America's own "Carbon Colony." The story of how fossil fuel extraction is changing the rural West is one that receives little national attention.

If the importation of less than 30 percent of fossil fuel consumption in the United States is an important economic story, then a thorough investigation of the economic situation that drives the other 70 percent should be just as vital. This economic policy brief aims to tell this story, with a focus on production in the American West. However, the United States does import a significant amount of its fossil fuel energy, suggesting that fossil fuels have become a global commodity to a large degree. Thus, the second area this brief intends to examine is the effect of globalization on the fossil fuel economy of the American West.

The United States economy has become increasingly globalized over the last sixty years. In 2010, 28.6 percent of America's economic activity was the result of international trade, compared to 20.4 percent in 1990, 11.1 percent in 1970, and just 8.2 percent in 1950.³ Foreign investment in

the United States economy has similarly been increasing. In 2007, just before the recent recession, foreign investment as a percentage of American gross domestic product was 15 percent. In the 1980s and early 1990s, this number hovered just above 2 percent, and in the 1960s foreign investment was virtually nonexistent, consistently falling below 1 percent.⁴

At the same time, the United States economy is currently \$14.9 trillion, which means a huge segment of domestic production and consumption exists.⁵ Oil and gas contributes about 7.5 percent of American GDP, while coal adds just less than 1 percent.⁶ However, in many western states abundant in fossil fuels, the percentage of GDP contributed by oil, gas and coal production is much greater than the American economy as a whole. For instance, in Wyoming, fossil fuel production contributes almost 40 percent of state GDP.⁷ Even a state such as Texas, which has a large and diverse economy, relies on oil and gas production for almost 25 percent of its GDP.⁸ This sampling of economic data demonstrates the globalized nature of the American economy within the scope of strong domestic demand and at the same time indicates the importance of fossil fuels to economic activity in the American West. An important question then is whether these two economic phenomena overlap in any significant way.

This economic policy brief shows that fossil fuel production in the American West is not as directly connected to the world economy as the United States economy is as a whole. Direct foreign influence has some impact on fossil fuel production in the American West. However, it is the indirect effects of globalization that are currently exerting the greatest impact on fossil fuel production in the American West. The globalized and international market nature of commodities like oil, natural gas and coal affects prices across the globe, which in turn reaches into the American West, influencing domestic production.

The growth of developing nations like China, India and Indonesia has had the greatest influence on international fossil fuel demand over the last twenty years, which in turn has influenced fossil fuel production in the American West. China's economy has grown at more than 7.5 percent annually since the early 1990s.⁹ This rapid economic growth has increased China's appetite for fossil fuels. In 1990, China consumed 2.3 million barrels of oil per day; by 2008, its consumption had grown to 7.83 million barrels a day, placing it behind only the United States in worldwide consumption.¹⁰ China and India are now the first and fourth largest emitters of carbon dioxide from burning fossil fuels.¹¹ More than half of world's top twenty CO₂ emitters are now fast-growing developing nations.¹² Consumption of fossil fuels abroad, even if those fuels do not come from the American West, affects production and costs in the rural West.

This policy brief examines fossil fuel production in the American West from a domestic and international perspective. First, the basic economics behind fossil fuel production and consumption is outlined. Next, historical and current trends in fossil fuel production in the American West are examined. This includes a detailed discussion of oil, natural gas, and coal, and of economic impacts nationally and in the states where these fossil fuels are produced. Trends in domestic versus foreign production are also discussed. The third section investigates international demand for fossil fuels and the link to production in the American West. Finally, this brief attempts to predict some of the trends and considerations, both domestic and international, that will influence future fossil fuel production in the American West.

The Economics of Fossil Fuels

Fossil fuel production and consumption conforms to basic microeconomic principles like any other consumable good, with supply and demand determining the production and consumption of those goods. In theory, in perfectly competitive markets a fossil fuel supplier will only be able to charge consumers the amount it costs to produce that fuel. Perfect competition does not exist in the real world fossil fuel economy, but competition is a factor in determining the price of fossil fuels in both international and domestic markets.

An important qualifier to basic supply and demand economics is that fossil fuels are an extractable natural resource with a fixed supply. Fossil fuel producers know that there is a fixed supply of oil, natural gas and coal in the earth, and these producers must decide when to extract this resource. A simple model assumes a current period and a fixed number of future periods over which a producer must decide when and how much to extract of the fossil fuel resource. If demand is high in the current period, then a producer will decide to extract more of the fossil fuel resource in the current period in order to receive the higher price created by high demand, and will therefore leave less of the resource in the ground for future extraction. Conversely, if demand is low in the current period, then producers will extract less (or even none) in the current period and leave the fossil fuel resource in the ground to extract in the future when it may be more valuable. A dwindling supply of a fossil fuel resource will also drive up the price of that resource in a current period, enticing producers to extract more of that resource and exhausting the supply even faster.

This dilemma leads fossil fuel producers to try to predict future demand so they know when to extract fuels in the most profitable manner. There is a fixed amount of fossil fuels in the ground, but producers have obviously not discovered all recoverable deposits, nor do they know the precise amounts of the fossil fuel deposits they have discovered. Thus, as new reserves are discovered and better measurements of current reserves are developed, the production conditions for fossil fuels can change.

It is important to note the difference between fossil fuel or other natural resource production, and the production of regular consumable goods that we purchase in stores every day. For example, a hypothetical producer of “widgets” and a fossil fuel producer both must decide how much of their good to produce every period. However, if a widget producer ends up producing too many or too few widgets for current demand, this producer only suffers in the current period from the mistake, and can adjust and produce the proper number of widgets in future periods. On the other hand, if a fossil fuel producer makes the mistake of producing too much or too little in a current period, that mistake affects the producer in the current period and in all future periods because it affects the remaining reserve. Because fossil fuels are a fixed extractable resource, making a production mistake in any period affects future profits.

Traditionally, fossil fuel prices have followed a cyclical pattern, which results from fossil fuel producers each individually following the economic rationale laid out above. When these decisions are aggregated, the cycle results. The beginning of a cycle starts with rising demand and low production. This leads to increasing prices as higher demand starts to outstrip the current production supply. In response to these high prices, fossil fuel producers increase their production in order to reap the higher profits available to them from high prices. Producers’ enthusiasm for increasing supply to achieve higher profits then leads supply to eventually overtake demand.

The price of the fossil fuel drops in response to this oversupply. Supply remains stagnant for a time with prices low, until demand once again rises to catch up with supply and the cycle begins anew.

Economists generally agree that oil is the fossil fuel that most closely follows this cyclical supply and demand pattern.¹³ A close examination of world oil prices over the last thirty years tends to support this hypothesis.¹⁴ Though less research has been done to analyze the price cycle of natural gas and coal, significant evidence still exists that a similar, though less drastic cycling affects coal and natural gas.¹⁵

The final basic economic consideration for thinking about fossil fuels is the concept of marginal costs. Fossil fuels are truly global commodities, traded on both domestic and international markets. Of course these fossil fuel commodities do not just magically move from the ground to the end consumer. The cost of recovering and transporting fossil fuels is always an economic factor that enters into the supply and demand equations. Oil may be a global commodity and priced internationally, but logic dictates that it probably costs less to transport oil from Texas to California than it does to ship oil from Texas to Asia or Europe. These economic factors are important to remember as this brief moves on to discuss fossil fuel production in the American West and the foreign considerations that affect this production.

Current and Historical Production in the American West

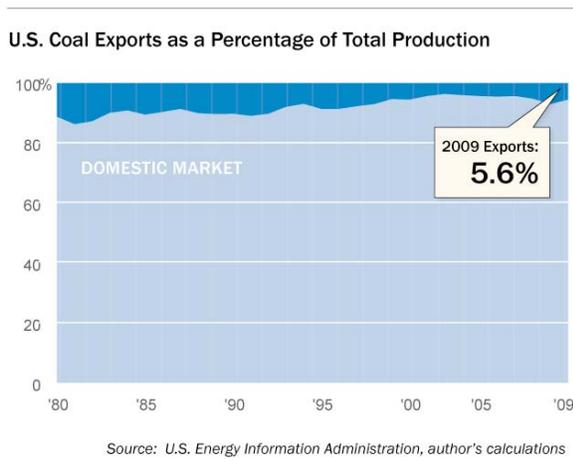
The American West is the carbon-producing heart of the United States. The large majority of the fossil fuel production that happens in the United States occurs in the American West.¹⁶ Oil, natural gas, and coal production originated in the eastern United States more than a century ago, but has been steadily shifting westward.¹⁷ Oil and natural gas production shifted dramatically from east to west after World War Two and accelerated through the 1950s and 1960s.¹⁸ American coal production, which was historically concentrated in Appalachia, has taken longer to shift from east to west. It was not until the late 1990s that the American West became the major coal-producing region in the United States.¹⁹

The obvious reason for the shift from eastern to western production is that the 18 states that comprise the US West hold the vast majority of the fossil fuel reserves that remain to be exploited from the American landscape.²⁰ As fossil fuel production increased in the West, the industry took on an important local economic role and a vast responsibility as the major supplier of fossil fuel energy to the United States as a whole. Though this brief aims to look at the role of international demand on fossil fuel production, it is also important to note the major impact of domestic demand. The United States consumes almost all of the domestically produced stock of oil, natural gas, and coal.²¹

This section of the brief examines production of each of the three fossil fuels in the western United States. Historical production trends for each fossil fuel are discussed, along with both domestic and international consumption. Economic impacts specific to the American West, including the labor and tax impacts of fossil fuel production, are examined. Direct foreign influence in each fossil fuel industry is evaluated. Finally, select states with unique significance are discussed.

Coal

The United States has more coal than any other fossil fuel. At current levels of consumption, the United States has more than 235 years of coal reserves remaining, with the large majority of those reserves in the American West.²² Coal is also the fossil fuel that is least influenced by direct foreign production or consumption. Historically, the Appalachian states of Kentucky and West Virginia, along with the rustbelt state of Pennsylvania, had been the major coal producers. However, the new dominant state in American coal production is Wyoming, which, along with Montana and a handful of other Western states, is leading the rural West towards an economic future in which coal production will play a major role.



In 2009, the United States produced 1.07 billion short tons of coal.²³ The United States has fallen into a steady pattern of producing between 1 billion and 1.2 billion short tons of coal every year for the last fifteen years.²⁴ In 1995, the distribution of coal production was about 53 percent in the Eastern US and 47 percent in the western United States. By 2009, that distribution had switched dramatically, with the West accounting for 55 percent and the East accounting for 45 percent.²⁵ This change in the balance of U.S. production can be attributed to an increase in Western production in concert with a decline in Eastern production. In 2009, the

American West produced 625 million short tons.

Almost all of those 625 million short tons were consumed within the United States.²⁶ Just over 93 percent of American-produced coal in 2009 was consumed domestically.²⁷ Of the coal consumed domestically, 90 percent was used to generate electricity.²⁸ In the United States, 45 percent of all electricity is generated from coal, with over 600 generating plants in operation across the country.²⁹ Coal extracted in the American West is especially suited for domestic electricity production because of its low sulfur content; laws for coal-fired power plants in the United States have mandated reduced sulfur emissions over the last decade.³⁰

Coal production in the American West has a mixed economic impact. Most of the money that stays in rural communities is the result of taxes and indirect economic contributions such as services provided to coal companies, such as construction and transportation. Direct economic gains are likely to flow away from rural communities to parent coal companies, while labor benefits can be transient. In 2008, coal production added 65.7 billion dollars to U.S. GDP,³¹ accounting for well under 1 percent of total GDP.

Coal has a limited impact on the economy of western states because most of it is mined on the surface rather than underground. Surface mining produces three times as much coal per hour as the underground mining practiced mostly in the eastern United States.³² This means coal mining in the rural West requires far fewer workers than mining in the eastern United States. Despite producing 55 percent of domestic coal, the West only accounts for just over 25 percent of the country's coal miners.³³ Thus, a state like Wyoming, which produces two and a half times as much coal as West Virginia, gains essentially the same amount of benefit added to its GDP as West

Virginia does.³⁴ This disparity is due to more wages from the higher number of workers in West Virginia as compared to Wyoming. These wages factor into the GDP of each state. This disparity in direct economic benefit also results from the tendency of large coal companies like Peabody Energy and Arch Coal to operate in the West, unlike the smaller local operators found in the East. These large companies are more likely to take their profits out of production regions such as Montana and Wyoming than do companies operating in the eastern United States.

Tax revenue probably constitutes the most significant lasting impact of coal mining in the American West. Western coal mining contributes between \$2 billion and \$8 billion dollars in tax revenue to state and local coffers.³⁵ This tax revenue has the potential to provide a lasting benefit for communities in the rural West if state governments use it effectively.

Foreign production and investment in Western coal is currently quite small, but this was not the case for much of the 1990s. In the late 1970s, American coal production was completely dominated by domestic companies.³⁶ However, in the 1980s, production in the United States by foreign companies jumped to between 15 percent and 20 percent for the decade and then increased again in the 1990s to around 25 percent of production.³⁷ Not incidentally, this period coincided with high foreign direct investment (FDI) in American coal. This FDI originated primarily from Canada and Australia, and to a lesser extent from Western Europe and Japan.

It is important to note the difference between foreign production and foreign direct investment. FDI can lead to foreign production, but only if a foreign company owns 51 percent or more of the coal being extracted. Therefore some FDI only results in a minority, non-controlling stake for foreign companies, while other FDI results in foreign control and therefore foreign production.

We can credit the expansion of western American coalfields in the late 1990s and into the 2000s for allowing American companies to reassert dominance over domestic production. American companies leveraged these fields into greater capital and used this capital to take control of other domestic coal resources. During the late 1990s and onward, FDI dried up, and at the same time American companies bought out foreign companies.³⁸ In the 2000s, foreign production has dropped considerably in the United States and currently sits at only 5 percent.³⁹ Of the 15 largest coal companies responsible for more than 75 percent of production, only one is foreign and accounts for only 1.5 percent of production.⁴⁰

If foreign investment is currently a small part of the Western coal landscape, exportation of coal to foreign countries is just as minimal. Unlike foreign investment, however, exportation of coal has been consistently low in the last 30 years, averaging between 5 percent and 10 percent of total production.⁴¹ As mentioned earlier, this is due to strong domestic demand for coal-fired power generation, which accounts for a large fixed amount of American consumption. The top export destinations for American coal are Canada and Europe, with South America and Asia also having some significance.⁴² China receives a fluctuating amount of American coal, with the total never reaching more than 10 percent of U.S. exports or more than 0.1 percent of total American production.⁴³

Colorado, New Mexico, North Dakota, Texas, and Utah are all major coal producing states in the American West. Each of these states produce between 20 million and 35 million short tons of coal annually.⁴⁴ However, the states at the center of coal production in the American West are Wyoming and Montana, which are first and fifth nationally in coal production.⁴⁵ Wyoming is the most important coal producing state in the Union, accounting for around 40 percent of US

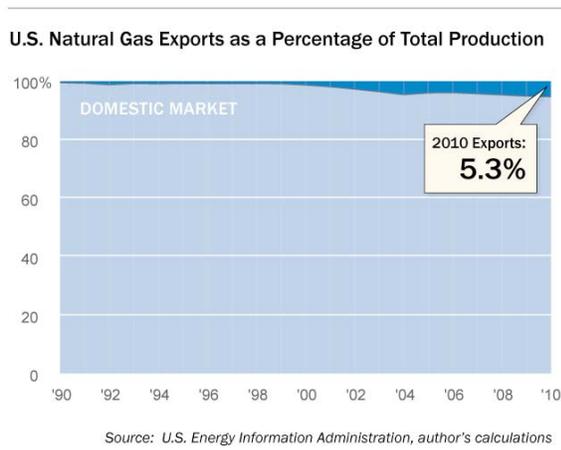
production (around 400 million short tons).⁴⁶ Wyoming is almost single-handedly responsible for the balance of coal production shifting from east to west. Wyoming production has increased by 150 million tons annually over the last 15 years.⁴⁷ Montana has the potential to repeat Wyoming's rise, as it contains the largest coal reserves in the United States. Montana holds 75 billion short tons in recoverable reserves and Wyoming holds another 39 billion short tons,⁴⁸ accounting for more than 44 percent of American reserves. The entire West holds 62 percent of the recoverable reserves in the United States,⁴⁹ reserves that are the most easily mined by surface techniques. This positions the American West at the center of current and future American coal production.

Natural Gas

Like coal, the United States is rich in natural gas. However, unlike coal, the United States does not possess the world's largest reserves of natural gas, but rather sits behind the major Middle Eastern producers and Russia.⁵⁰ Nonetheless, with shale gas adding to American reserves, domestic natural gas supply looks to be secure into the distant future.⁵¹ Natural gas is also primarily domestically produced and consumed, and is presently centered in the American West.

In 2008, the United States produced 20.3 billion cubic feet of natural gas.⁵² Five of the six highest-producing states in the United States were located in the West: Texas, Wyoming, Oklahoma, Colorado, and New Mexico. These five states accounted for 70 percent of American production, with other Western states adding to an even higher total.⁵³ Starting in the late 1960s, the United States has consistently produced between 17 and 21 billion cubic feet of natural gas.⁵⁴ The United States consumes slightly more natural gas than it produces, making it a net importer.⁵⁵ In 2008, the United States as a whole consumed 23.2 billion cubic feet of natural gas, and needed to import about 3 billion cubic feet more to meet that number.⁵⁶ Domestic demand for natural gas is apportioned among many sectors, some with fixed needs and others that have more malleable consumption patterns. About a third of natural gas is consumed by electrical utilities, which have a fixed base which has generally been growing.⁵⁷ The other two-thirds of domestic consumption comes from variable end users apportioned between industry and residential consumers.⁵⁸

Foreign production and investment in western American natural gas is slightly larger than coal, but still quite small overall. Unlike the coal industry, American producers have always primarily concentrated natural gas production in the West. Historically, production in the West by foreign natural gas producers has fluctuated between 4 percent and 12 percent.⁵⁹ Between 1980 and 2002, this range moved gradually up to 12 percent, and then has dropped slowly over the last decade to 9 percent today.⁶⁰ Not coincidentally, FDI in Western natural gas followed a similar pattern over the same time period. As with coal, the major foreign investors during this period were companies from Canada, Japan, Europe, and Australia.⁶¹ Of the 22 current major natural gas producing companies in the United States, four are foreign: two from Canada, one from the United Kingdom, and one from the Netherlands.⁶²



Exports of American natural gas are small and have only recently reached almost 5 percent of domestic production.⁶³ Exports from the American

West are even smaller, as most natural gas exported by the United States is sent to Canada from producers in the Northeast.⁶⁴ Texas and California are responsible for exports that account for around 1.5 percent of total domestic production, with these exports being destined for Mexico.⁶⁵ Exports to Canada and Mexico by American producers are determined by the convenience of regional geography.

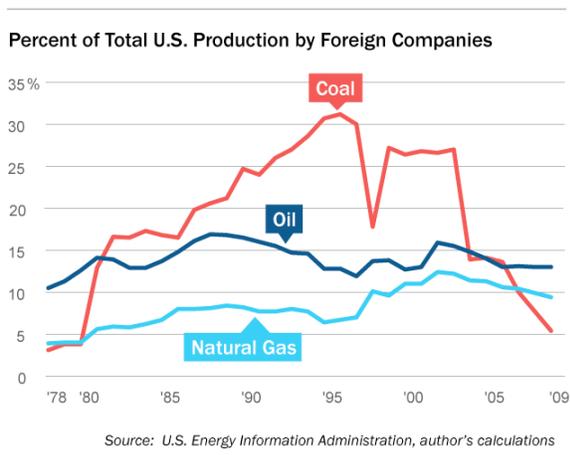
As mentioned in the opening of this section, Texas, Wyoming, Oklahoma, Colorado, and New Mexico are the primary natural gas producing states in the American West. Each of these states is likely to continue as major natural gas producers due to their strong mix of traditional and shale gas reserves.⁶⁶ Texas deserves special mention for several reasons. First, it is by far the largest producing state in the United States, producing 3.5 times more natural gas than any other state and accounting for one-third of total U.S. production.⁶⁷ In addition, Texas holds between one-quarter and one-third of all domestic natural gas reserves based on conventional estimates.⁶⁸ In addition, Texas also has two of the largest shale gas fields in the United States, the Barnett and Eagle Ford fields.⁶⁹ Shale gas is also why North Dakota must be mentioned as an important future natural gas producer. Despite hosting very few conventional natural gas wells and reserves, North Dakota contains what may be one of the largest shale gas fields in the United States, the Bakken field.⁷⁰

Crude Oil

Unlike coal and natural gas, the United States is not rich in crude oil. In 2008 the United States produced on average 5 million barrels a day of crude oil.⁷¹ Over a quarter of American production comes from offshore oil wells.⁷² However, when it comes to onshore production, the West is the region that dominates production. Nine of the 10 highest producing states are in the American West, which account for 69 percent of total U.S. production and over 90 percent of onshore production.⁷³ However, Western production and U.S. aggregate production have been declining steadily over the last 35 years. Crude oil production peaked in the early 1970s at 9.5 million barrels per day and has steadily declined since.⁷⁴ Even with new shale oil reserves being discovered in the West, total reserves continue to shrink every year.⁷⁵

Oil is the most globalized fossil fuel in the United States and the American West's economy. A lot of the foreign influence surrounding oil has to do with America's strikingly high dependence on foreign oil for consumption.⁷⁶ Though this topic is beyond the scope of this brief, the dependence on foreign oil hints at the importance of domestic consumption when it comes to domestic production of oil. American hunger for oil consumption far outstrips domestic production, thus leading to a large net importation of oil.

The United States consumes a staggering 18.8 million barrels of oil a day, accounting for 22 percent of worldwide consumption.⁷⁷ Transportation accounts for 72 percent of American consumption, followed by commercial and residential heating, and industrial processes.⁷⁸ Transportation costs are a somewhat elastic demand driver, and transportation demand will react to price changes in oil. The United States imports more than half the crude oil it consumes. The United States imports more oil than China uses in total, even with China being the second largest consumer of oil in the world⁷⁹



Production of oil in the American West by foreign companies was about 13 percent of total domestic production in fiscal year 2007-2008.⁸⁰ This is the highest percentage of any fossil fuel produced in the West. Oil production by foreign companies in the United States has hovered between 10 percent and 15 percent over the last thirty years. In 1980, foreign production was similar to today. It grew slowly between 1980 and the early 1990s, reaching 15 percent. It declined during the 1990s, fluctuated again in the last decade and settled at its current rate.⁸¹ FDI over the same time period once again mapped foreign production trends, except for one brief spike between 1998 and

2000.⁸² During this period, British Petroleum made several major acquisitions of American production companies.⁸³ BP has held onto these acquisitions, but divestiture by other foreign corporations smoothed out the investment curve. Other European and Canadian companies also invested in American oil production, and some funding came from the Middle East.⁸⁴ The same foreign companies from Canada, Australia and the United Kingdom that are major natural gas producers in the American West are also oil production companies.⁸⁵

As we have already seen, American demand for oil products is much higher than what is produced domestically, necessitating a large amount of imports. However, the United States actually exports a large amount of the oil that it produces. In 2009, the United States exported on average about 2 million barrels per day of oil products, or just under 40 percent of American production.⁸⁶ This export situation is due to the America's large refining capacity⁸⁷: it imports crude oil at the same time that it exports finished petroleum products like gasoline and jet fuel.⁸⁸ High crude oil producing countries like Mexico and Canada receive a lot of their refined oil products from the United States, while shipping the United States an even greater amount of crude oil.⁸⁹ Other countries that receive major amounts of refined American oil products are smaller nations like Singapore and some Caribbean island nations.⁹⁰ Exports of American petroleum products have steadily risen over the last 30 years, due to the efficiency of the American refining system.⁹¹

Alaska, California, and Texas, along with offshore oil production make up over 75 percent of American oil output.⁹² These states are likely to continue to be significant oil producers, but their production is expected to continue to slowly decline, like U.S. production as a whole.⁹³ Even with shale oil coming online in states like North Dakota, Western production is unlikely to accelerate past current yields; nevertheless, the West will remain the heart of American onshore oil production.

Crude oil and natural gas¹ are much more significant contributors to the American economy than coal. Oil and gas production in the United States added 1.04 trillion dollars towards American GDP in 2007, or about 7.5 percent of the total.⁹⁴ As with coal, the economic impact of oil and gas in rural Western communities derives mainly from tax revenue and indirect economic impacts. Once again, direct economic impacts and labor revenue tend to have a transitory impact on rural Western communities.⁹⁵

¹ Many sources aggregate data on oil and gas consumption, so they are considered together for this segment of the brief.

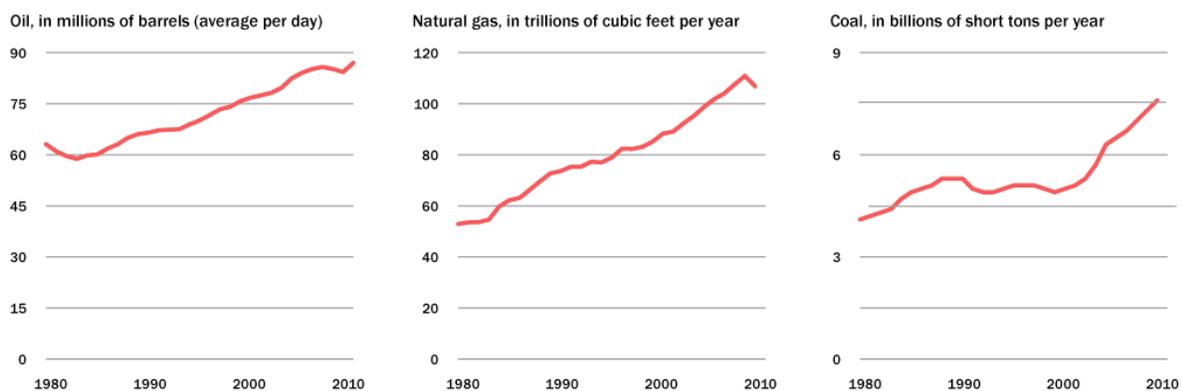
In major producing states like Oklahoma, Texas, and Wyoming, oil and gas output adds more than 20 percent to state GDP.⁹⁶ However, when you only analyze oil and gas production’s direct impact on GDP, the added value is usually cut in half.⁹⁷ Because most of the direct economic impact leaves rural Western regions and is absorbed by the large oil and gas companies that are headquartered elsewhere, the indirect economic impacts of oil and gas production are what remain in rural Western communities.⁹⁸ The labor impacts of oil and gas production in the American West are also fleeting. Placing oil and gas wells requires a large amount of labor, but once production begins in an oil or gas field, the amount of required labor shrinks dramatically.⁹⁹ Regional conditions also dictate whether many or few oil or gas rigs are needed to exploit a particular field.

Tax revenue is the one truly lasting impact on Western states that have high levels of oil and gas production.¹⁰⁰ In 2008, national revenue from state taxes on oil and gas production was \$18.1 billion.¹⁰¹ Of this revenue, \$16.5 billion was from oil and gas production in the American West. Top states like Alaska and Texas accrued \$6.9 billion and \$4.1 billion respectively.¹⁰² This massive amount of revenue, like the tax revenue from coal, has the potential to be a major boon for Western state economies if used effectively.

Indirect International Influence on Fossil Fuel Production

Apart from crude oil refining, fossil fuel production in the United States or the American West is not as internationalized as the economy as a whole. The fraction of foreign production and investment to overall production of fossil fuels is only about one-half to two-thirds of the economy-wide fraction of foreign investment in the total US economy. Trade in natural gas and coal is well below overall international trade, while oil tracks at or slightly above current norms. Thus, for all three fossil fuels—when it comes to foreign investment—and for two of the three fossil fuels—when it comes to trade—direct foreign influence is not an outsized driver of production. Even in the case of oil, it is American consumption patterns and demand that have drawn in foreign oil. Direct foreign influence in Western fossil fuels is low. However, *indirect* foreign influence has been a much greater driver of production in the American West.

Worldwide Energy Consumption



Source: U.S. Energy Information Administration, author’s calculations

In 1980, the world consumed about 63 million barrels of oil per day. Ten years later in 1990, the world consumed about 66 million barrels a day of oil, only a 4.5 percent increase in oil

consumption over 1980.¹⁰³ However, another 10 years later in 2000, the world consumed 77 million barrels of oil per day, a much larger (16 percent) increase over 1990 levels. Between 2000 and 2010, world oil consumption jumped another 9.5 percent to 85 million barrels of oil per day.¹⁰⁴ By looking at the small increase in oil demand between 1980 and 1990, we can deduce where the major increase in demand originated between 1990 and 2010.

In 1980, Asia's consumption of oil was 10.7 million barrels per day, with the highly developed Japanese economy accounting for almost half of this consumption.¹⁰⁵ By 1990, Asia's oil consumption had increased to 13.1 million barrels a day.¹⁰⁶ This shows an increase in Asian consumption of around 18 percent, compared to the global average increase of 4.5 percent. Much of the global increase came from the fast growing Asian tiger economies of Taiwan, South Korea, and Singapore, where oil consumption increased dramatically, and in the larger economies the China, India, and Pakistan where oil consumption increased at a slower rate.¹⁰⁷ Between 1990 and 2000, Asia's appetite for oil exploded, jumping from 13.1 million to 20.9 million barrels per day, a 62 percent increase.¹⁰⁸ Over this period, Asia accounted for 73 percent of the increase in world oil consumption. China more than doubled its consumption during this period, as did many other developing Asian nations such as Indonesia, Malaysia, India, and Thailand. Between 2000 and 2010, Asian consumption increased another 18 percent to 25.5 million barrels per day. Between 1980 and 2010, China's consumption alone quadrupled.¹⁰⁹ During this period developing nations in Latin America and the higher income countries in the Middle East also started to experience oil consumption growth.

At the same time, developed world consumption remained essentially flat between 1980 and 2010. Russia's consumption was cut in half after the disintegration of the Soviet Union, and Europe's consumption also gradually declined, as did Japan's.¹¹⁰ The only developed nation to really increase consumption was the United States, and even this growth was limited: from 17 million to 19.1 million barrels per day over the whole 30-year period. The price of oil during the 1980 to 2010 period lagged slightly behind demand. Between 1980 and the mid 1990s crude oil prices declined and then leveled out.¹¹¹ The price dip in the first half of the period can mostly be attributed to the supply bump in world production after the threat of the Arab oil crises in the 1970s. However, between 1998 and 2011, oil prices increased in real terms by 550 percent, going from \$16 a barrel to \$104 a barrel. The rise in prices we see in the second half of the period can be attributed to a delayed reaction in prices as the increasing demand from Asia built up and then started to push against world supply.

Global coal consumption follows a similar pattern to oil, but one that is even more extreme. In 1980, the world consumed 4.1 billion short tons of coal annually. By 2009, world consumption had almost doubled to 7.5 billion short tons, an increase of 55 percent.¹¹² China is almost exclusively responsible for this increase in consumption. In 1980, China consumed 700 million short tons of coal. By 2009, China's consumption had increased to 3.5 billion short tons, a growth of 385 percent.¹¹³ In fact, China was responsible for 82 percent of world growth in coal consumption over this period. China's growing demand for coal-fired electricity was the main driver of this increase.

Coal prices followed a delayed rise similar to oil prices, but in a less extreme fashion. In fact, coal prices in real terms are only slightly higher today than they were in 1990.¹¹⁴ In constant dollars the price of a U.S. short ton of coal in 1990 was \$28.75 where as the price today hovers just over

\$30.¹¹⁵ This slight change between 1990 and today hides the larger pattern in coal prices over the last 35 years. Coal sold at a high price of over \$50 a short ton for the second half of the 1970s in response to the Arab oil crisis that accelerated demand for other types of fossil fuels.¹¹⁶ From 1980 on the price of coal slowly started to decline as new production started to overtake the demand spike of the mid 1970s. This slow slide in prices continued all the way until the start of the twenty-first century, with prices starting a slow uptick over the last seven to ten years and increasing more dramatically over the last two years.¹¹⁷ It is this recent uptick in coal prices over the last seven to ten years that can be associated with increased Chinese demand taking up the slack in supply in the global coal market.

Natural gas has been the fossil fuel with the greatest increase in global consumption over the last 30 years. Between 1980 and 2010, the worldwide consumption of natural gas more than doubled, from 57,000 billion cubic feet a year to 107,000 billion cubic feet a year.¹¹⁸ This growth in natural gas, unlike coal and oil, cannot be solely attributed to developing Asian nations such as China. In fact the growth in consumption of natural gas is truly a global trend with almost every major region on earth doubling its consumption, except the United States, which has grown more modestly.¹¹⁹ Developing Asia has had the sharpest rise in natural gas consumption over the last 30 years going from 2,500 billion cubic feet a year in 1980 to 18,000 billion cubic feet a year in 2009.¹²⁰ Europe, South America, the Middle East, and even Africa have also made significant contributions to world demand for natural gas over the last quarter century.

Natural gas has shown the clearest trend of rising prices in response to world demand. From 1980 to 2008 the price of natural gas grew fivefold.¹²¹ In 1980 the price of a thousand cubic feet of natural gas was \$1.59. By the year 2000 the price had jumped to \$3.68 and by the year 2008 to almost \$8.¹²² However, in the last two years the market has seen natural gas prices drop by half, to around \$4 per thousand cubic feet.¹²³ This is likely due to the discovery of increased reserves of natural gas in Russia, the Middle East, and in shale gas deposits within the United States.

The *indirect* influence of foreign nations on fossil fuel production in the American West can clearly be seen in the form of demand for these fossil fuel resources. The main outcome of this increased demand has been to raise the prices of fossil fuels produced in the American West. This has led to greater transfers of wealth within the United States between fossil fuel producers and fossil fuel consumers. This increase in price pressure has not led to increased production beyond American consumption or to increased exports. The fact that the United States is such a massive consumer of fossil fuels is why production in the American West has generally marched along with American consumption as a whole. Fossil fuels produced in the American West are likely to continue to be consumed domestically, with prices continuing to be influenced by global markets. These trends are discussed below.

Future Considerations and Trends

In analyzing current and historical trends in fossil fuel production in the American West, we have seen what effect foreign and domestic factors have had up until the present. To close, this paper considers some of the future trends and considerations that may affect fossil fuel production in the American West.

The first question to consider is whether demand from abroad will continue to drive prices in the American West, and whether it also will start to influence more production. A majority of

economists and major economic organizations, including the U.S. Energy Information Administration (EIA) and the International Energy Agency (IEA), project that demand from Asia, and particularly China, is likely to continue to grow.¹²⁴ How much this demand is going to grow is uncertain. The IEA projects that under current world policies, global energy consumption will grow at 1.4 percent between now and 2035, which is a high rate, but still lower than the 2 percent rate of the previous 25 years.¹²⁵ Developing Asia will be responsible for almost all of this growth, with China accounting for half. Under this scenario, demand will increase, leading to higher prices and higher production of fossil fuels in the American West.

On the other hand, the IEA and the U.S. EIA conclude that if the world takes the threat of climate change seriously and follows through on policies to combat this threat, world energy demand will grow much more slowly. Under greenhouse gas reduction scenarios, world energy demand is projected to grow at between 0.7 percent and 1.2 percent.¹²⁶ In these scenarios, Asian demand still drives this change, but overall demand is low enough to reduce price and production demand pressure. In this situation, price pressure may slowly subside for coal and natural gas, but will remain for oil. Therefore, international pressure on coal and natural gas production in the American West will not likely have as much effect.

A potential scenario with less plausibility, but one that is still discussed by economists is “overheating” by the Chinese economy.¹²⁷ This overheating of the Chinese economy through unsustainable economic growth and inflation could lead to either a hard or soft landing for the Chinese economy. With a hard landing, economic growth in China could plummet, and even with a soft landing, economic growth could decline markedly. Under both of these situations, demand for fossil fuels would drop significantly, leading to both a price decline and potentially a production decline in the American West. The potential for the Chinese economy to overheat is a true wildcard, and its implications for fossil fuel demand and production in the American West would most likely be negative. However, it is hard to predict its long-term future impact.

Multiple scenarios exist for future fossil fuel production in the American West as framed by world demand. In one, domestic demand will still play a large role in western production. In almost every future scenario, American fossil fuel demand stays relatively flat or increases slightly.¹²⁸ This means that fossil fuel production in the American West will still have a fairly stable demand generated domestically. American production and consumption of fossil fuels have followed this pattern fairly steadily over the last 10 to 15 years. The biggest effect, then, on production in the American West from abroad will come in the form of price pressure (as in the past) and potentially in increased production pressure for export.

However, production decisions will also be made on the basis of international competition. As mentioned in the previous section, production competition from countries like China, the Middle East and Russia may make it hard for American fossil fuel producers to export. In addition, export infrastructure concerns also remain. The United States lacks major liquid natural gas exportation facilities and American ports are not currently configured to export much more coal than current levels. The cost of improving this infrastructure would be significant for producers.

In almost all future scenarios, oil demand will stay robust.¹²⁹ This means that the American West is likely to continue to receive a premium price for the oil it produces. However, most prognostications about oil production predict it is likely to continue to decline because of the lack of reserves. A few American government scenarios are highly optimistic that shale oil and new reserves can stem this decline. In the most ambitious greenhouse gas reduction scenarios, oil

demand will potentially slacken near the end of the next 25 years, leading to a price crash.¹³⁰ In most cases, the global oil supply and demand equations are likely to push the boundaries of the cost of production, meaning that in the coming years producers will be hard pressed to find enough oil to satisfy world demand. Meeting this demand will require new technologies and new discoveries of oil, beyond the boundaries of what the industry is doing today.

In all future scenarios set out by the IEA and U.S. EIA, world demand for natural gas is expected to grow briskly.¹³¹ At the same time, with the discovery of massive shale gas deposits around the world and huge conventional reserves in Russia and the Middle East, it is likely that the natural gas supply will be sufficient for meeting this demand.¹³² For the American West, this means that at various times over the next 25 years the price of natural gas is likely to be depressed. In addition, with other regions of the world (such as Russia and the Middle East) being more accessible to Asia via pipeline delivery, it will probably be a challenge for American producers to export. However, it is likely that American production will be able to step in and meet the current gap in American consumption that is filled by international imports.

Coal production in the American West may have the most uncertain future of any fossil fuel discussed in this brief. This uncertainty is linked to the glut of world supply in natural gas. In some future scenarios, a significant portion of the world's and America's energy consumption switches from coal to natural gas. In other scenarios, coal demand continues to increase, driven once again by China.¹³³ Western coal probably has the highest potential for future export of the fossil fuels, but this future is still far from certain. Predicting the price and demand going forward is a more volatile exercise.

Finally, it is also hard to predict any certain trends in future direct foreign investment in fossil fuel production in the American West. It is likely that foreign investment from European, Canadian, and Australian companies will continue at a rate similar to the past. Investment from developing nations such as China and India depend as much on politics as on economics. As these nations continue to grow, it is likely that the economic power of their biggest fossil fuel companies will grow as well. This would dictate that these corporations would look to invest abroad to increase their production and economic power. Chinese companies have already begun to invest in fossil fuel extraction in developing countries in places such as Africa and South America.¹³⁴ New research on Chinese investment patterns shows that Chinese companies are likely to continue to invest in fossil fuel resources in developing nations.¹³⁵ This research also shows that Chinese investment in the United States is more likely to be in advanced industries and manufacturing than resource industries.¹³⁶ Politics are also likely to play a role in any future Chinese investment, with American leaders in Washington helping to shape the terms under which investment occurs.

It is important to consider the consequences of fossil fuel production in the American West on the region itself. Whatever influence international factors have on fossil fuel production in the American West, the consequences of this production will transform the states and communities that produce these fossil fuels. The American West is no stranger to the booms and busts provoked by commodity extraction, including the extraction of fossil fuels.¹³⁷ When thinking about fossil fuels in the American West, we must consider the classic political and economic theories of the "resource curse" and "Dutch disease." The "resource curse" theory shows that contrary to what one would expect, areas that have an abundance of fixed natural resources (such as fossil fuels) tend to have poor overall economic growth and economic development. Dutch disease theory compliments the resource curse theory, by explaining that areas with abundant fixed natural resources tend to overexploit these resources at the expense of developing other

economic sectors like manufacturing. These theories remind us that relying too heavily on a commodity such as fossil fuels can hurt the overall economic development of a region.

For some heavy fossil fuel producing states, such as Texas and California, which have large and diversified economies, the effect of these theories on the eventual decline of fossil fuel production is probably not a concern. However, the heavy dependence on fossil fuels in states such as Wyoming and Alaska should raise some flags. These states must take into account the costs of relying on fossil fuel economies that can be influenced by far-ranging domestic and foreign influences. They must also consider the lost opportunity costs that come from exploiting fossil fuels, as land polluted by fossil fuel extraction is difficult to use for future economically beneficial activities. Though it may be difficult for states such as Wyoming to diversify their economies, they should try. Lastly, tax revenue is one of the longest-lasting benefits of fossil production. States in the American West must consider how to use these revenues to insulate themselves from outside influences and to put their states on sound footing for the future.

Conclusions

In closing, this policy brief offers five important working conclusions that can be derived from the research in this paper.

1. Foreign direct investment into fossil fuel production within the American West is occurring at a much lower rate than foreign direct investment in the American economy as a whole.
2. The foreign direct investment that is occurring in the fossil fuel industry in the American West is coming mostly from companies based in Europe, Canada, and Australia. This is a continuation of historical patterns of investment that have been occurring for the last 30 to 40 years.
3. The biggest influence that foreign countries are having on fossil fuel production in the American West is through their demand for fossil fuels. This increased global demand has translated into higher domestic prices for fossil fuels, but not higher production or export of these fossil fuels.
4. Massive American consumption of fossil fuels is still the main driver of demand for fossil fuel production in the American West. This major domestic demand, along with international competition, is likely to ensure that the majority of fossil fuels produced in the American West will continue to be consumed within the United States in the future.
5. Price pressure on fossil fuel production in the American West is likely to be the lasting impact of indirect foreign influence. Sustained price pressure on oil is most likely, then coal, with natural gas experiencing the least pressure.

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