



Marcellus Shale: Land Ownership, Local Voice, and the Distribution of Lease and Royalty Dollars



TIMOTHY W. KELSEY, ALEX METCALF, AND RODRIGO SALCEDO

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Marcellus Shale: Land Ownership, Local Voice, and the Distribution of Lease and Royalty Dollars

TIMOTHY W. KELSEY, ALEX METCALF, AND RODRIGO SALCEDO¹

1. Introduction

Development of Marcellus shale is having a broad range of positive and negative impacts across many of the Pennsylvania communities where drilling is occurring. It has been an economic opportunity for some residents, an environmental or quality of life concern for other residents, and is generating conflict within many communities. There has been much recent policy debate about the proper role of local government in regulating such natural gas development, and the extent to which local communities should have discretion in deciding whether, where, and how to allow shale gas development.

The recently passed Act 13 of 2012 limits local discretion, formally preempting much local regulation of this shale gas development. Under Act 13, local governments must allow drilling in all zoning districts, and cannot ban or restrict gas development. In such a context of little local government control, the leasing decisions of individual mineral right owners become one of the most important ways residents have a 'voice' in whether and how Marcellus shale development will occur in their community. Who owns the land and mineral rights in Marcellus counties thus critically determines who can participate in the decisions that will affect the community. Local elected and appointed officials, and residents who own little or no land have relatively little voice about whether natural gas development occurs within their community. The decision is largely in the hands of current owners of larger parcels of land who decide whether to lease for drilling, and in gas companies who then decide where among the leased parcels to actually drill.

The ownership of the rights also affects who receives the lease and royalty dollars created by gas development. Natural gas companies reported they paid \$2.07 billion in lease and royalty payments related to Marcellus shale development in Pennsylvania in 2010 (Considine, Watson and Blumsack, 2011). Such payments are a significant part of the economic benefit of natural gas development, accounting for about one third of gas industry spending in Pennsylvania between 2008 and 2010 (ibid). Understanding how these dollars are distributed is important from several perspectives. These include how many of these dollars remain within the counties with drilling and related activity, how broadly the economic benefits flow across county residents, and how these dollars compare to the distribution of the costs of Marcellus development. The latter has significant equity implications which underlie much of the public policy debate about the Marcellus shale play (Kelsey, Shields, Ladlee and Ward, 2011). Economic studies of Marcellus shale to date have mostly focused on estimating the overall economic benefits, but have not addressed the equally-important understanding of how the economic benefits are distributed among residents and non-residents, nor the costs of such development.

This paper examines the ownership of the land within eleven Pennsylvania counties with Marcellus development activity, and the implications of that land ownership pattern for who has a 'voice' in decisions over the activity and for the distribution of lease and royalty dollars. Much of the public debate about Marcellus shale development revolves around differing views of fairness and equity, particularly discussions about the environmental, health, and other risks, the proper role for local

¹ The authors are a Professor of Agricultural Economics, a Post-Doctoral Scholar in the School of Forest Resources, and a graduate student in Agricultural, Environmental, and Regional Economics, Penn State University.

government regulation and oversight of industry activities, and the ability of individual owners to use their resources as they believe is appropriate. This study is not intended to evaluate or make judgments about Act 13 of 2012 or the current distribution of control and income. Rather we believe that understanding landownership patterns helps to clarify the economic implications of Marcellus shale development, and the context for the concerns some are expressing about the need for more local government control over that development.

2. Methodology

As in many other states, surface land owners in Pennsylvania do not necessarily own the mineral rights under their land; surface and mineral rights can be owned (and sold) separately. The separation of surface and mineral rights is relatively common in areas of Pennsylvania with past coal, oil, and gas development. When development of these mineral resources began generations ago, many of these mineral rights were severed from surface rights as landowners either sold off the mineral rights or kept those rights when they sold the surface land.

We could find no publicly available documentation that details ownership of mineral rights, other than on a deed-by-deed basis. In contrast, GIS landownership data is available in most Pennsylvania counties within the Marcellus region. Landownership and mineral right ownership should align very closely in counties with little past coal, gas or oil development, so landownership patterns in these counties should accurately reflect the underlying mineral right ownership. In counties where mineral and landownership has been severed, the landownership information most likely overestimates the proportion of land owned by county residents because the rights severed generations ago have subsequently been passed down through families, splintering into ownership held across children and grandchildren. With the relatively high amount of out-migration from Pennsylvania over the past decades, it is likely that many of the current mineral right owners live outside of their ancestral county, if not outside the Commonwealth itself. Landownership data also likely underestimates the concentration of mineral rights ownership in counties with past coal and gas development because coal and other resource extraction companies were active purchasers and aggregators of such rights during the original resource development, consolidating mineral rights from multiple properties together under their ownership. Some companies have remained active purchasers of such rights over the generations.

To examine likely mineral right ownership, we collected publicly available Geographic Information System (GIS) data about landownership from eleven county planning offices. Counties included in the study are Bradford, Butler, Clearfield, Fayette, Greene, Lycoming, Sullivan, Tioga, Washington, Westmoreland and Wyoming. The data was from early 2010 through 2011, depending upon the county. The eleven counties include nine of the top ten Marcellus counties in Pennsylvania; the sole missing top ten county was Susquehanna County, for whom the GIS information was unavailable (Susquehanna had the fifth largest number of wells through 2011). Together, the eleven counties account for 79 percent of all Pennsylvania Marcellus wells through 2011. To supplement the GIS data, we examined U.S. Census household data on home ownership and renting, to determine the share of households that did not own land.

We identified parcels owned by county residents by looking at the zip code of owners' mailing addresses. Publicly owned land was identifiable in the data for some of the counties whose datasets included specific codes specifying such ownership, including Bradford, Sullivan, Tioga, and Wyoming. For the other counties, we had to physically look at the GIS property records to identify if the listed

owner was in the public or private sector. Since most of the publicly owned land, such as state forest land, state game land, and Fish and Boat Commission land, is in relatively large parcels, we physically reviewed the ownership records of all parcels 50 acres in size or larger in these counties to identify which were publicly owned. Any public sector parcels smaller than 50 acres would be counted as privately owned land in our analysis, but the relatively small number and size of these parcels likely do not affect results substantially.

The county resident land owners included a mix of individuals, families, local businesses, farmers, hunting camps, land trusts, and others. Individual owners often own more than one parcel, so we needed to aggregate all of each land owner's properties together. A single owner's name can vary across different parcel records (e.g. 'J. Smith,' 'John Smith,' and 'John A. Smith' may all refer to the same owner), so aggregating by name is not accurate. We instead used owners' mailing addresses to aggregate the parcels, calculating the total land owned by residents at that address. This approach assumes all land owners living at the same address are either the same person or are related.

For each county, we sorted the resident landowners by the total acreage each owned (from largest amount of land to smallest amount of land). We then broke this list of acreage owned into ten equal parts (what scientists call 'deciles'), allowing us to identify the acreage owned by the largest 10 percent of resident landowners, the acreage owned by the second largest ten percent of resident landowners, and so forth.

3. Results

A. Home Ownership and Renting

Not all county residents own land or own their own home. Table 1 provides the Marcellus counties ordered alphabetically, with the number of Marcellus wells, state rank by Marcellus wells, the total number of households in the county, and the percentage of households that are home owners and renters in each. In Bradford County, for example, there were 998 Marcellus wells drilled between 2007 and 2011, making it the county with the most Marcellus wells during that time period. According to the 2010 U.S. Census, Bradford County had 24,861 households, with 74.8 percent of these households owning their own home.

Comparing across the counties, about one-quarter of the households in these eleven counties do not own their own homes, but rather rent from someone else (see Table 1). This varied between the counties, ranging from a low of 17.4 percent of households in Sullivan County, to a high of 30.2 percent in Lycoming County. These renters have no input to the decisions of landowners to lease their land, or of gas companies to drill in the county.

Table 1. Home Ownership and Renting Households

County	Marcellus Wells, 2007 to 2011	State Rank by Marcellus Wells	Number of Households	Percent of Resident Households, 2010	
				Home Owners	Renters
Bradford	998	1	24,861	74.8%	25.2%
Butler	102	10	71,911	77.0%	23.0%
Clearfield	131	9	32,823	76.7%	23.3%
Fayette	177	8	55,363	73.0%	27.0%
Greene	384	6	14,010	75.3%	24.7%
Lycoming	455	4	46,612*	69.8%*	30.2%*
Sullivan	42	19	2,436	82.6%	17.4%
Tioga	666	2	17,182	74.9%	25.1%
Washington	534	3	83,604	77.3%	22.7%
Westmoreland	187	7	152,640	76.5%	23.5%
Wyoming	95	13	11,023	77.1%	22.9%

*Entire county, not just the smaller Marcellus shale region of the county
 Data sources: PA Department of Environmental Protection; U.S. Census

B. Residence of Owners

An earlier GIS study of landownership and Marcellus shale, using the Conservation Biology Institute’s United States Protected Areas shape file, found that around 17 percent of the Marcellus shale acreage across all counties in Pennsylvania is owned by the public sector, which primarily is the Commonwealth with its state forest, game commission, and other agency land (Kelsey, Shields, Ladlee and Ward, 2011). The remaining 83 percent is owned by individuals and companies.

Table 2 shows the distribution of land ownership in the eleven studied counties, based on the current GIS analysis of 2010 and 2011 county landownership records. The percentage of land area in the counties owned by the public sector varied between 4.1 percent (Washington County) and 37.5 percent (Sullivan County), while the percentage of land owned by people living outside the county varied between 18.3 percent (Washington County) and 34.3 percent (Greene County). The share of land area owned by residents in these counties varied between 29.3 percent in Sullivan County, to 77.6 percent in Washington County.² This variation in the percentage of privately owned land across counties suggests wide differences in the extent to which local landowners influence Marcellus development leasing and drilling in their county. The number of private county resident owners does not directly correspond to the number of households because land owners include local businesses, hunting camps, and other non-households.

² These numbers are consistent with the prior study, with the exception of Lycoming County. The prior study was able to solely focus on the Marcellus shale region of Lycoming County, and found that about 14 percent of the land in the Marcellus region Lycoming County was owned by county residents. This is the northern half of the county, outside of the Williamsport urban and suburban area, and the location of many of the vacation homes, recreational forest land, large hunting camps, and other land likely to be owned by non-residents. For this study, due to the different dataset, we were unable to separate out the non-Marcellus region of the county.

Table 2. Distribution of Land Ownership by Residency

County	Percent of land owned by Public Sector	Percent of land owned by people from outside the county	Percent of land owned in-county	Number of Households (U.S. Census)	Number of Private, in-county owners
Bradford	8.6%	31.1%	60.3%	24,861	16,938
Butler	5.5%	19.5%	75.0%	71,911	56,723
Clearfield	18.5%	30.6%	50.9%	32,823	34,401
Fayette	12.7%	24.9%	62.4%	55,363	46,028
Greene	4.2%	34.3%	61.5%	14,010	12,130
Lycoming*	32.6%	19.0%	48.4%	46,612	35,270
Sullivan	37.5%	33.2%	29.3%	2,436	2,297
Tioga	24.9%	27.5%	47.7%	17,182	9,944
Washington	4.1%	18.3%	77.6%	83,604	70,688
Westmoreland	6.7%	21.1%	72.3%	152,640	134,560
Wyoming	15.1%	32.3%	52.6%	11,023	7,895

*Ownership county-wide, not just in the smaller Marcellus shale region of the county

C. County Resident Private Landowners, by Amount of Land Owned

The majority of county resident landowners within these counties owned relatively small amounts of land. Table 3 shows the percentage of county resident landowners sorted by the amount of local land they own, and in parentheses, the share of the total locally owned private land area owned by those landowners. For example, in Bradford County, 38.6% of the county resident landowners own less than one acre of land in the county, and together all of the land owned by this 38.6% of resident landowners accounts for 0.6% of the locally owned private land area in the county.

In all the counties, landowners with small land parcels typically accounted for only a small proportion of the total private land area owned by county residents. In Westmoreland County, for example, 74.9 percent of the resident landowners owned less than one acre of land, which accounted for 6.9 percent of the total resident-owned private land in the county. About 71.7 percent of resident landowners in Washington County similarly owned less than one acre of land, which accounted for 4.1 percent of the total resident-owned private land in the county. This finding should not be surprising, given that typical residential properties in suburban and urban areas tend to have relatively small lot sizes.

A much smaller share of resident private landowners in the counties owned large amounts of land. The proportion of resident landowners owning 1,000 or more acres, for example, ranged from 0.004 percent in Butler and Westmoreland counties, to 0.4 percent in Tioga County. Their share of the total resident-owned private land varied between 0.8 percent in Butler County to 26.8 percent in Sullivan County. The shares owned by the largest ten percent of landowners generally were larger in the more rural counties, such as Sullivan, Wyoming, and Bradford counties, than in the more suburban counties, reflecting the greater proportion of their residents who farm, or who own woodlots or recreational land, and local businesses involved in land-intensive activities. The largest resident landowners in these more rural counties included hunting and fishing clubs, land development companies, coal and energy companies, timber companies, farms, and private individuals, with the mixture varying between the counties.

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Table 3. County Resident Landowners, by Amount of Land Owned

Percent of Local Landowners (Percent of County Resident-owned Private Land Area)											
Amount of Land Owned	<i>Bradford</i>	<i>Butler</i>	<i>Clearfield</i>	<i>Fayette</i>	<i>Greene</i>	<i>Lycoming*</i>	<i>Sullivan</i>	<i>Tioga</i>	<i>Washington</i>	<i>Westmoreland</i>	<i>Wyoming</i>
Less than 1 acre	38.6% (0.6%)	57.0% (3.3%)	57.2% (2.0%)	62.2% (3.3%)	49.5% (1.1%)	60.7% (2.0%)	26.9% (0.4%)	33.5% (0.4%)	71.7% (4.1%)	74.9% (6.9%)	39.4% (1.1%)
1 to 1.9 acres	12.3% (0.7%)	14.4% (3.1%)	12.3% (1.6%)	13.4% (2.7%)	11.7% (0.9%)	11.6% (1.5%)	14.6% (0.6%)	13.0% (0.5%)	9.6% (2.2%)	9.7% (3.8%)	15.5% (1.3%)
2 to 4.9 acres	11.5% (1.4%)	11.9% (5.7%)	11.8% (3.4%)	10.3% (4.7%)	9.5% (1.6%)	10.3% (3.0%)	17.7% (1.5%)	13.3% (1.2%)	6.8% (3.5%)	7.2% (6.3%)	15.9% (3.0%)
5 to 9.9 acres	7.0% (2.0%)	5.8% (6.2%)	5.8% (3.8%)	4.6% (4.7%)	6.0% (2.3%)	4.6% (3.0%)	9.1% (1.8%)	8.4% (1.8%)	3.3% (4.0%)	3.0% (6.0%)	7.5% (3.2%)
10 to 19.9 acres	8.8% (4.8%)	3.9% (8.3%)	4.0% (5.1%)	3.4% (6.9%)	5.8% (4.4%)	4.0% (5.2%)	8.7% (3.2%)	8.4% (3.3%)	3.1% (7.1%)	2.1% (8.1%)	6.7% (5.5%)
20 to 49.9 acres	8.8% (10.9%)	3.6% (17.5%)	4.0% (12.0%)	3.0% (13.8%)	7.0% (12.5%)	3.6% (10.9%)	9.0% (8.0%)	8.8% (8.1%)	2.4% (12.9%)	1.7% (15.2%)	7.1% (13.7%)
50 to 99.9 acres	6.0% (16.5%)	2.0% (21.5%)	2.7% (17.4%)	1.7% (17.1%)	5.5% (21.2%)	2.5% (16.9%)	6.5% (12.8%)	6.2% (12.5%)	1.5% (18.0%)	0.9% (17.8%)	3.9% (16.8%)
100 to 199.9 acres	4.3% (22.7%)	1.0% (20.0%)	1.4% (17.8%)	1.1% (21.0%)	3.8% (27.4%)	1.7% (21.9%)	4.1% (15.8%)	5.2% (20.5%)	1.1% (24.9%)	0.5% (19.7%)	2.7% (22.0%)
200 to 499.9 acres	2.4% (27.1%)	0.2% (10.2%)	0.5% (14.4%)	0.3% (13.0%)	1.2% (18.5%)	0.7% (19.1%)	2.6% (22.1%)	2.6% (21.8%)	0.3% (14.1%)	0.1% (8.9%)	1.3% (21.4%)
500 to 999.9 acres	0.4% (9.3%)	0.04% (3.4%)	0.2% (8.8%)	0.1% (7.0%)	0.1% (1.9%)	0.01% (5.3%)	0.4% (7.1%)	0.4% (7.1%)	0.03% (3.0%)	0.01% (2.3%)	0.1% (5.4%)
1,000 or more acres	0.1% (4.2%)	0.004% (0.8%)	0.08% (13.6%)	0.03% (5.8%)	0.03% (8.3%)	0.01% (11.2%)	0.2% (26.8%)	0.4% (22.9%)	0.01% (6.0%)	0.004% (5.1%)	0.03% (6.7%)

*Entire county, not just the smaller Marcellus shale region
Does not add to 100% due to rounding error
Data source: County planning office landownership data

D. Share of Land Owned by County Residents, by Decile

When the county resident private land owners are ranked from those owning the least to the most land and then stratified into deciles based upon the amount of land they own, the distribution of landownership among residents becomes apparent. Table 4 shows the percentage of the total county resident land owned by each decile of resident landowners, and in parentheses, the cumulative share of that land ownership across the deciles. For example, in Bradford County, the bottom 10 percent of resident landowners together own 0.1 percent of the county resident-owned land in the county. The 11 to 20 percent smallest landowners in Bradford County similarly together own 0.1 percent of the county resident-owned land, and together with the bottom 10 percent of landowners, own 0.2 percent of the total county resident-owned land.

The GIS analysis shows that a relatively small percentage of landowners in each county typically own a very large proportion of the locally owned total private land area in that county. The top ten percent of resident landowners in these counties, for example, own 72.7 percent or more of the land area owned by county residents (the 72.7 percent was in Bradford County). The highest proportion of land owned by the top ten percent of local landowners, 88.3 percent, occurs in Washington County (see Table 4). The top twenty percent of resident landowners (adding the numbers in Table 4 for the 81-90% and 91-100% deciles) together own between 89.1 percent and 94.6 percent of the total land area (Bradford and Lycoming counties, respectively). In contrast, the half of the resident landowners owning the least land in these counties together own between 1.1 percent and 2.7 percent of the total resident-owned private land area (see the cumulative numbers in parentheses in the “41-50” decile row) (Greene and Westmoreland counties, respectively).

E. Distribution of Landownership

When the landownership data is considered as a whole, including the land owned by non-residents and by the public sector, the distribution of control over the land in these counties, and where lease and royalty dollars are going becomes clearer. Table 5 shows the percentage of land area in each county owned by the public sector, owners who live outside of the county, and owners who are county residents. County resident owners are shown as their proportion of the total land area, and by the decile of land owners. In Bradford County, for example, 8.6 percent of the land area is owned by the public sector, 31.1 percent is owned by people living outside the county, and 60.3 percent is owned by county residents. Of the total land area in Bradford County, 43.9 percent of the land area is owned by the top ten percent of county resident landowners.

The Weighted Average column at the extreme right of Table 5 is the distribution of landownership across all the studied counties except Lycoming (the latter was omitted because it includes information from the entire county, not just the portion of the county with Marcellus, and thus would bias the averages), weighted by the land area of each county. Across the ten counties (omitting Lycoming), 13.1 percent of the total land area is owned by the public sector, 26.7 percent is owned by non-residents, and 60.2 percent is owned by residents of the county. Across all the counties, a little less than half of the total land area in the counties (48.9 percent) is owned by the largest ten percent of county resident landowners.

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Table 4. Share of County Resident-Owned Land Area, by Decile of Local Landowners

Share of County Resident-Owned Land Owned by Decile (Cumulative Share)											
Decile of Local Land Owners	<i>Bradford</i>	<i>Butler</i>	<i>Clearfield</i>	<i>Fayette</i>	<i>Greene</i>	<i>Lycoming*</i>	<i>Sullivan</i>	<i>Tioga</i>	<i>Washington</i>	<i>Westmoreland</i>	<i>Wyoming</i>
Bottom 10% of local landowners	0.1% (0.1%)	0.1% (0.1%)	0.1% (0.1%)	0.2% (0.2%)	0.1% (0.1%)	0.1% (0.1%)	0.1% (0.1%)	0.1% (0.1%)	0.1% (0.1%)	0.2% (0.2%)	0.1% (0.1%)
11-20% of local landowners	0.1% (0.2%)	0.3% (0.4%)	0.2% (0.3%)	0.3% (0.4%)	0.1% (0.2%)	0.2% (0.3%)	0.2% (0.2%)	0.1% (0.2%)	0.2% (0.3%)	0.3% (0.6%)	0.2% (0.3%)
21-30% of local landowners	0.2% (0.4%)	0.5% (0.9%)	0.3% (0.6%)	0.4% (0.8%)	0.2% (0.4%)	0.2% (0.5%)	0.3% (0.5%)	0.2% (0.3%)	0.4% (0.7%)	0.6% (1.2%)	0.3% (0.6%)
31-40% of local landowners	0.3% (0.7%)	0.7% (1.6%)	0.3% (0.9%)	0.5% (1.3%)	0.3% (0.7%)	0.3% (0.8%)	0.45 (0.9%)	0.3% (0.6%)	0.4% (1.1%)	0.7% (1.8%)	0.5% (1.1%)
41-50% of local landowners	0.6% (1.2%)	0.9% (2.5%)	0.5% (1.4%)	0.7% (2.0%)	0.4% (1.1%)	0.4% (1.2%)	0.6% (1.5%)	0.5% (1.2%)	0.7% (1.8%)	0.9% (2.7%)	0.8% (1.9%)
51-60% of local landowners	1.1% (2.3%)	1.4% (3.9%)	0.8% (2.3%)	1.1% (3.0%)	0.7% (1.8%)	0.7% (1.9%)	1.0% (2.6%)	1.0% (2.2%)	0.8% (2.6%)	1.2% (3.9%)	1.2% (3.1%)
61-70% of local landowners	2.6% (4.9%)	2.2% (6.1%)	1.4% (3.7%)	1.7% (4.7%)	1.5% (3.4%)	1.2% (3.1%)	2.1% (4.7%)	2.3% (4.5%)	1.2% (3.8%)	1.7% (5.6%)	2.1% (5.2%)
71-80% of local landowners	6.1% (11.0%)	3.9% (10%)	2.8% (6.5%)	2.9% (7.6%)	4.7% (8.1%)	2.3% (5.4%)	4.6% (9.3%)	5.1% (9.5%)	2.1% (5.9%)	2.9% (8.5%)	4.5% (9.7%)
81-90% of local landowners	16.4% (27.3%)	9.8% (19.8%)	7.7% (14.1%)	7.2% (14.7%)	16.4% (24.5%)	7.2% (12.7%)	12.8% (22.1%)	14.3% (23.8%)	5.8% (11.7%)	6.3% (14.8%)	12.8% (22.5%)
Top 91-100% of local landowners	72.7% (100%)	80.3% (100%)	85.9% (100%)	85.3% (100%)	75.5% (100%)	87.4% (100%)	77.9% (100%)	76.2% (100%)	88.3% (100%)	85.2% (100%)	77.6% (100%)

*Entire county, not just the smaller Marcellus shale region
Does not add to 100% due to rounding error
Data source: County planning office landownership data

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Table 5. Landownership in Each County, By Address of Owner

Address of Owner	Share of Land Area Owned											Weighted Average+	
	Bradford	Butler	Clearfield	Fayette	Greene	Lycoming*	Sullivan	Tioga	Washington	Westmoreland	Wyoming		
Public Sector (mostly Commonwealth of Pennsylvania)	8.6%	5.6%	18.5%	12.7%	4.2%	32.6%	37.5%	24.9%	4.1%	6.7%	15.1%	13.1%	
Outside of County	31.1%	19.5%	30.6%	24.9%	34.3%	19.0%	33.2%	27.5%	18.3%	21.1%	32.3%	26.7%	
Inside County	60.3%	75.0%	50.9%	62.4%	61.5%	48.4%	29.3%	47.7%	77.6%	72.3%	52.6%	60.2%	
Breakdown of County Resident Owners by Decile	Bottom 10% of local landowners	0.1%	0.1%	0.1%	0.1%	0.1%	0.0%	0.0%	0.0%	0.1%	0.1%	0.1%	0.1%
	11-20% of local landowners	0.1%	0.2%	0.1%	0.2%	0.1%	0.1%	0.1%	0.0%	0.2%	0.2%	0.1%	0.1%
	21-30% of local landowners	0.1%	0.4%	0.2%	0.2%	0.1%	0.1%	0.1%	0.1%	0.3%	0.4%	0.2%	0.2%
	31-40% of local landowners	0.2%	0.5%	0.2%	0.3%	0.2%	0.1%	0.1%	0.1%	0.3%	0.5%	0.3%	0.3%
	41-50% of local landowners	0.4%	0.7%	0.3%	0.4%	0.2%	0.2%	0.2%	0.2%	0.5%	0.7%	0.4%	0.4%
	51-60% of local landowners	0.7%	1.0%	0.4%	0.7%	0.4%	0.3%	0.3%	0.5%	0.6%	0.9%	0.6%	0.6%
	61-70% of local landowners	1.6%	1.6%	0.7%	1.1%	0.9%	0.6%	0.6%	1.1%	0.9%	1.2%	1.1%	1.1%
	71-80% of local landowners	3.7%	2.9%	1.4%	1.8%	2.9%	1.1%	1.3%	2.4%	1.6%	2.1%	2.4%	2.3%
	81-90% of local landowners	9.9%	7.3%	3.9%	4.5%	10.1%	3.5%	3.7%	6.8%	4.5%	4.6%	6.7%	6.2%
	Top 91-100% of local landowners	43.9%	60.2%	43.7%	53.2%	46.4%	42.3%	22.8%	36.3%	68.5%	61.6%	40.8%	48.9%
*Entire county, not just the smaller Marcellus shale region +Omits Lycoming County Data source: County planning office land ownership data Does not add to 100% due to rounding error													

i. Local Control (or 'Voice') Over Marcellus Shale Development

The GIS analysis in Table 5 conveys the relative 'voice' that landowners have through their leasing decisions about whether Marcellus drilling should occur within the county. Resident landowners in Butler County control 75 percent of the total land area there, while resident landowners in Sullivan County only control 29.3 percent of the total land area, reflecting large differences between the counties in state and/or non-resident landownership and county resident landownership. Butler County is just north of Pittsburgh, with relatively little state owned land and relatively fewer second homes and camps. In contrast, Sullivan County is a very rural county in the northern tier, with a very small population (only 6,428 in 2010, according to the U.S. Census). Almost two-fifths of the land is state-owned land (37.5 percent of the land area), and one-third is owned by people living outside the county. The local economy relies heavily upon tourism and second homes. These differences in landownership across counties reflect large variations in the extent to which people living in the counties can influence decisions regarding Marcellus development.

The Commonwealth government owns about 13.1 percent of the total land area in these ten Pennsylvania counties,³ while an additional 26.7 percent is owned by landowners living outside the respective counties. Together, this means that non-residents make decisions about 40 percent of the land area in these counties, with this percentage of non-resident control varying between the counties, from 22.4 percent in Washington County to 70.7 percent in Sullivan County.

The 'voice' of the landowners living within the counties is highly concentrated in a relatively small share of landowners. A little less than half of the total land area in these counties (48.9 percent) is owned by the top 10 percent of resident landowners. This varies quite a bit across the counties, from a low of 22.8 percent in Sullivan County, to a high of 68.5 percent in Washington County (Table 5). In contrast, the bottom 80 percent of resident landowners together only control between 2.5 percent and 7.4 percent of the land area in these counties (add the "Bottom 10%" through "71-80%" deciles) (Lycoming and Butler counties, respectively).

The percentage of county residents having a formal voice in whether and how natural gas development occurs is smaller than these numbers convey, however, because Table 5 ignores county residents who own no land. As discussed previously, the percentage of households in these eleven counties who rent, and thus do not have the choice of leasing property for gas development, ranges between 17.4 and 30.2 percent.⁴

³ Lycoming County is omitted from this calculation

⁴ The landownership data in Table 5 and the Census household renting/ownership information cannot be directly combined because the former includes business, hunting camp, land trust, and other non-household property owners.

ii. Distribution of Lease and Royalty Dollars

The landownership data in Table 5 also reflects how lease and royalty dollars from Marcellus Shale development will be distributed in locations where the land owners also own the mineral rights. County residents, including individuals, households, local businesses, hunting camps, and other owners based in the county, will receive about 60.2 percent of all leasing and royalty dollars generated by drilling in the ten counties.⁵ Non-county resident landowners will receive about 26.7 percent of all lease and royalty dollars, while the public sector will receive about 13.1 percent.

The distribution of lease and royalty income among county resident landowners is identical to the distribution of land ownership and 'voice' as discussed in the previous section. The top 10 percent of the largest local landowners in the counties will receive between 22.8 percent and 68.5 percent of all lease and royalty dollars generated in those counties (Sullivan and Washington counties, respectively). As with the 'local voice,' the distribution of these lease or royalty dollars among all residents will be more concentrated than the deciles in Table 5 indicate because the analysis omits residents who rent.

4. Implications

The GIS analysis indicates that ownership of the land in the Pennsylvania counties with the most Marcellus drilling activity is concentrated in a relatively small share of residents, and in owners from outside the county. The majority of residents of these counties together own little of the total land area, and so have relatively little 'voice' in the critical leasing decisions which affect whether and how Marcellus shale drilling will occur in their county. Half of the resident landowners in the counties together only control 1.1 percent of the land area, and renters have no 'voice' at all. Rather it is the top 10 percent of resident landowners, plus outside landowners (both public and private), who are able to make the major leasing decisions that affect the rest of the community. In some counties, such as Sullivan, Tioga, and Lycoming, non-residents have more voice about what occurs than do county residents, because more than half of the land is owned by those outside the county.

The analysis furthermore indicates that a majority of lease and royalty income from Marcellus shale development will go to a relatively small share of the resident population in these counties, with much of the remainder going to others outside the counties. A little less than half (48.9 percent) of the lease and royalty dollars in these counties will go to the top ten percent of local landowners, while 39.8 percent will go to the public sector or non-resident landowners. The remaining 11.3 percent of lease and royalty income will be divided between the bottom 90 percent of local landowners.

Recent studies show that the economic benefits from shale gas development are more than just these lease and royalty dollars, so residents owning little or no land may be benefitting in other ways from Marcellus shale development. Unemployment rates generally have been lower in counties with much Marcellus shale activity (Center for Workforce Information and Analysis, 2011), for example, and retail sales have increased dramatically in some Marcellus counties (Costanzo and Kelsey, 2012). Many local businesses are reporting significant increases in sales (Ward and Kelsey, 2011). How broad-based these benefits are and how they are distributed among residents is unclear from these prior studies, however, but is important to know to understand the economic and community implications of Marcellus shale development, particularly for the 90 percent of local landowners with little land, and for the households who rent.

⁵ Calculation omits Lycoming County

It is clear from experience that residents in the counties with much drilling activity are dealing with disruptions and change, such as rising rents and housing prices and housing shortages (Williamson and Kolb, 2011), significant increases in traffic and road congestion, changing demands for local government services, and increased conflict within the community (Jacquet, 2009; Kelsey and Ward, 2011), concerns about environmental consequences (Stedman et al, 2011), student turnover in public schools as families move from district to district in search of cheaper rent (Schafft, Glenna, Borlu and Green 2011), and changes in the landscape (Alter, et al, 2010). The decisions by non-resident owners and by the relatively small share of residents who own the majority of land thus can have profound implications for the quality of life for everyone else in the community.

The analysis in this study assumes that landowners own the mineral rights under their property. This assumption likely holds in the Pennsylvania counties which have not experienced much past coal or gas extraction, such as in the Northern Tier, where there has been little prior interest or benefit to severing surface and mineral rights. In contrast, many of the counties in Southwest Pennsylvania have experienced prior coal or gas development, and thus surface and mineral rights were split or separated generations ago. Due to the movement of residents within the Commonwealth and the amount of out-migration from Pennsylvania over the decades, the proportion of mineral rights owned by county residents likely is lower than the proportion of land owned by residents in these counties with prior coal and gas development. The analysis in this study thus likely overestimates the local control in these counties, and the amount of lease and royalty dollars going to county residents. Because local coal and other resource extraction companies were active purchasers and aggregators of mineral rights during the prior coal and gas resource development in these counties, the analysis also likely underestimates the concentration of ownership within those counties.

In addition, the lease and royalty income distribution discussion assumes that there are not major differences in lease rates and royalty shares between landowners. Yet anecdotes about leasing commonly suggest that owners of larger parcels often have been able to negotiate better leasing terms than have smaller parcel owners. To the extent that larger landowners are receiving higher lease or royalty rates than are smaller parcel owners, the study underestimates the proportion of lease and royalty dollars going to the largest landowners.

Some of the land in the study is owned by hunting camps, who were considered local if the owners' mailing address in the tax record was within the county. Some of these camps may use a local address for the tax records (such as the address of a caregiver or manager), even if many of the camps' actual owners live outside the county. Similar to the landownership-mineral ownership assumption described earlier, in such cases the analysis will overestimate the amount and concentration of local landownership within the county.

Pennsylvania law limits the abilities of local governments to regulate or control shale gas development, which means owners' decisions about whether to lease, and with what conditions, are the primary local resident voice that affects where gas development occurs. The concentration of landownership, as detailed in the analysis presented here, means that the majority of residents in the counties with Marcellus shale development have relatively little voice in these decisions which have significant implications for their communities and for their own quality of life. A little less than forty percent of the land area within these eleven counties is owned by non-residents (including the Commonwealth) who do not have to live with the day-to-day nuisances and costs of natural gas development, but yet have potential gain through lease and royalty income. About 48.9 percent of the land is owned by the top ten percent of resident landowners, who have a large potential economic gain from gas development due to the amount of land they own.

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The rest of the resident landowners, in contrast, own a very small share of the total land area in these communities, so their decisions about whether to lease have relatively little impact on gas development in their community. Residents who rent and own no land have no formal voice in whether and how gas development occurs within their community. The potential economic benefit of local gas development to these latter groups of residents depends upon the potential employment and business opportunities, and most particularly the ability of local residents to get and hold jobs related to the industry activity. Experience is demonstrating that Marcellus shale development also can have significant impacts on the daily lives of residents within the counties with drilling activity. It thus should not be surprising that the development is generating conflict within communities, and that some citizens and local government officials across the Commonwealth want greater local control over natural gas development.

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