



**BUREAU OF BUSINESS AND
ECONOMIC RESEARCH**
UNIVERSITY OF MONTANA



THE ECONOMIC CONTRIBUTIONS OF THE SIBANYE-STILLWATER MINE OPERATIONS IN MONTANA

FINAL REPORT
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Sibanye-Stillwater
U.S. Region
Columbus, IN 59019

ACKNOWLEDGEMENTS

The BBER would like to acknowledge the assistance of Sibanye-Stillwater for providing the detailed operational information used in this report. All errors or omissions are our own.

THE ECONOMIC CONTRIBUTION OF THE SIBANYE-STILLWATER MINE OPERATIONS IN MONTANA

SUMMARY

This is a study of the contributions made to the economy of the state of Montana by the production, employment, spending and tax revenues that come about due to the state’s largest hard rock metal mining operation – the Sibanye-Stillwater mines and processing facilities in south central Montana. The company’s high-paying jobs, high value-added production, and significant tax payments add to the state economy in their own right. As the dollars paid to employees, vendors, and governments are in turn re-spent in the economy, their ultimate significance grows. The Bureau of Business and Economic Research at the University of Montana (BBER) was retained by Sibanye-Stillwater to carry out an analysis how the operations of the mining complex makes the state’s economy larger, more prosperous, and more populous. This report summarizes and documents the results.

Our basic finding is that the presence of the Sibanye-Stillwater mining operations in Stillwater and Sweet Grass Counties represent a sizable generator of economic prosperity, not only for the communities in which they are located, but for the state as a whole. In terms of measurable economic activity, we find that the presence of the Sibanye-Stillwater operations ultimately support

- Almost 6,000 permanent, year-round jobs across a wide spectrum of industries across the state;
- A half billion dollars of annual, recurring income received by Montana households, of which \$438 million is disposable, after-tax income;
- State tax and non-tax revenues of approximately \$95 million per year;
- Over \$1.5 billion in added economic output annually.

The presence of the mines and the processing facilities ultimately causes the population of Montana to be higher by 10,700, including 6,000 working-age adults.

Economic Contributions of Sibanye-Stillwater: Summary

CATEGORY	IMPACT
Total employment	5,995 jobs
Personal income	\$500.9 million
<i>Disposable personal income</i>	<i>\$438.0 million</i>
Selected state tax revenues	\$94.7 million
Output	\$1,556 million
Population	10,724 people

The size and the importance of the economic contributions made by the Sibanye-Stillwater mining complex will surprise very few in the communities within Stillwater and Sweet Grass Counties that are home to the company's operations. But the extraordinary impact that the 1,505 workers who mine and process precious metals in two mines in the front range of the Beartooth Mountains and who process the rock in the company's Metallurgical Complex in nearby Columbus may surprise those in other parts of the state. The outsized contributions of Sibanye-Stillwater's economic contributions come about for three main reasons:

- The highly mechanized, high value-added nature of the production process, supporting jobs which pay substantially more than the state average;
- The high "made in Montana" component of the company's basic input, namely, the ore excavated from the ground;
- The significant tax support paid by the company to state and local governments.

The impacts reported in this study undercount the actual economic contributions made by the production of platinum, palladium and other precious metals in south central Montana by Sibanye-Stillwater. That is because the economic contributions we present do not include the value of the product which is produced – including the cleaner, safer air we all enjoy from the reduced emissions of motor vehicles with catalytic converters made possible with the mine's products.

How These Results Were Produced

This research report addresses a basic question: what would the economy of the state of Montana look like if the Sibanye-Stillwater mining operations did not exist? The question calls for a comparison of two states of economic activity. The first is the actual economy as it exists today. The second, hypothetical economy is a representation of economic activity that would occur with the spending, production, employment and tax revenue associated with the mining operations removed.

The BBER used its state of the art economic model, leased from Regional Economic Models, Inc. (REMI), to produce a picture of the economy as it would exist in a no-mine scenario. Such an economy would lose not only the substantial spending and income flows that the mining operations themselves create, but also the subsequent rounds of income, spending and employment that are created as those flows are spent and respent in the state economy. The REMI model recognizes those linkages and thus is a useful tool for deriving the ultimate contribution of mining operations to the economy of Montana.

About the Bureau of Business and Economic Research

The Bureau of Business and Economic Research (BBER) is the preeminent business research organization in the state of Montana. Founded in 1948 as the research arm of the University of Montana's School of Business Administration. The Bureau's mission statement states,

"The purpose of the Bureau is to serve the general public, as well as people in business, labor, and government, by providing an understanding of the environment in which Montanans live and work."

BBER has since developed to become one of the most sought-after sources of information and analysis on the Montana economy. The Bureau has published the *Montana Business Quarterly*, an award-

winning business periodical, since 1962, and has conducted the Montana Poll, a quarterly sentiment survey of the Montana adult population, since 1980.

1. INTRODUCTION AND OVERVIEW

Sibanye-Stillwater is a global precious metals mining company with a significant presence in South Africa as well as at its Montana operations in North America. It is the third-largest producer of platinum-group metals (PGMs), primarily platinum and palladium, in the world. PGMs are a critical component to the catalytic converters that can be found in almost all of the 97 million cars and trucks produced globally each year. They also find extensive use in jewelry. The J-M reef geological formation in south central Montana that is accessed by the company’s Stillwater and East Boulder mines is the only known significant source of PGM deposits in the United States. It is also the highest grade PGM deposit known in the world.

The Sibanye-Stillwater presence in Montana consists of three integrated facilities. The Stillwater mine is located near the town of Nye in Stillwater County. The East Boulder mine is near the town of McLeod in Sweet Grass County. Both of these facilities, which have operated since 1986, are shallow to intermediate level underground mines. The company also operates the Columbus Metallurgical Complex in Columbus, Montana. This facility includes a concentrator and smelter, as well as a base metal refinery. In addition to platinum and palladium mining, the complex also engages in the recycling of PGMs from spent catalytic converters.

The mine complex was acquired by Sibanye in 2017, when it was re-named “Sibanye-Stillwater.” It is the largest hard rock mining company in the state: Total workforce in 2017 exceeded 1,500 employees, with a total payroll of close to \$182.3 million, of which approximately \$11.7 million constituted payroll taxes. Of particular note is the impact on property taxes in Stillwater and Sweet Grass counties, which are estimated at \$4.7 million per year (Table 1).

Table 1. Direct Economic Impacts of Sibanye-Stillwater

DIRECT ECONOMIC IMPACTS	
Number of employees	1,505
Total Payroll	\$182,850,651
<i>Gross Payroll (including vacation, holiday, sick leave)</i>	<i>\$171,190,603</i>
<i>Payroll Taxes (company’s FICS; federal and state unemployment)</i>	<i>\$11,660,048</i>
Total Taxes Paid	\$16,569,361
<i>Property Taxes</i>	<i>\$4,691,850</i>
<i>Metal Mines Gross Proceeds Tax</i>	<i>\$5,671,110</i>
<i>Metal Mines License Tax</i>	<i>\$6,206,401</i>
Total Purchases	\$441,765,840
<i>Goods and Services in Montana</i>	<i>\$112,294,952</i>
<i>Goods and Services Outside Montana</i>	<i>\$329,470,888</i>
Total Employee Taxes	\$44,552,370
<i>Employee withholding for Federal Taxes</i>	<i>\$25,983,910</i>
<i>Employee withholding for State Taxes</i>	<i>\$8,276,172</i>
<i>Employee withholding for FICA</i>	<i>\$7,742,887</i>
<i>Employee withholding for Medicare</i>	<i>\$2,549,401</i>

2. POLICY ANALYSIS WITH THE REMI MODEL

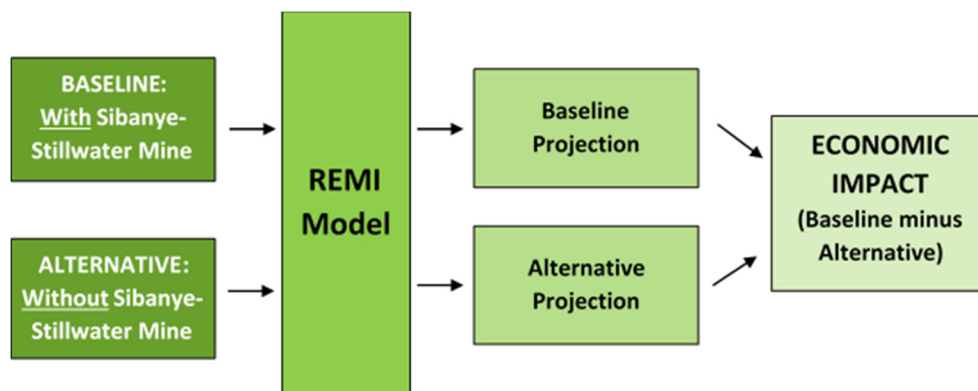
Regional economic impacts occur because of events or activities that create new expenditures within a region. “New spending” constitutes spending that is over and above existing expenditures, and which does not displace other spending elsewhere in the region. It not only adds to economic activity in its own right, but also induces further spending when the recipients of wages, sales, and tax revenues spend portions of their income in the local economy. Changes in the paths of investment, migration, prices, and wages are also possible.

This study utilized an economic model, calibrated to represent the interactions specific to the Montana economy, to estimate the economic impacts resulting from operations at the Sibanye-Stillwater mining complex. Leased from Regional Economic Models, Inc., the REMI model is one of the best known and most respected analytical tools in the policy analysis arena, and has been used in more than 100 previous studies as well as in dozens of peer-reviewed articles in scholarly journals. It is a state-of-the-art econometric forecasting model that incorporates dynamic feedbacks between economic and demographic variables. The REMI model forecasts employment, income, expenditures, and populations for counties and regions based on a model containing over 100 stochastic and dynamic relationships, as well as a number of identities. A full explanation of the design and operation of the model can be found in Treyz (Treyz, 1993).

The REMI Modeling Methodology

The basic approach of using the REMI model to produce the results for this study is illustrated in Figure 1, below. The analysis started with a baseline projection for the Montana economy, using the status quo assumption that the Sibanye-Stillwater platinum and palladium mine in Stillwater and Sweet Grass counties continues to operate at current levels. Next, the analysis employed the REMI model a second time, simulating an alternative scenario where the Sibanye-Stillwater mine and its associated economic activity are absent from the Montana economy.

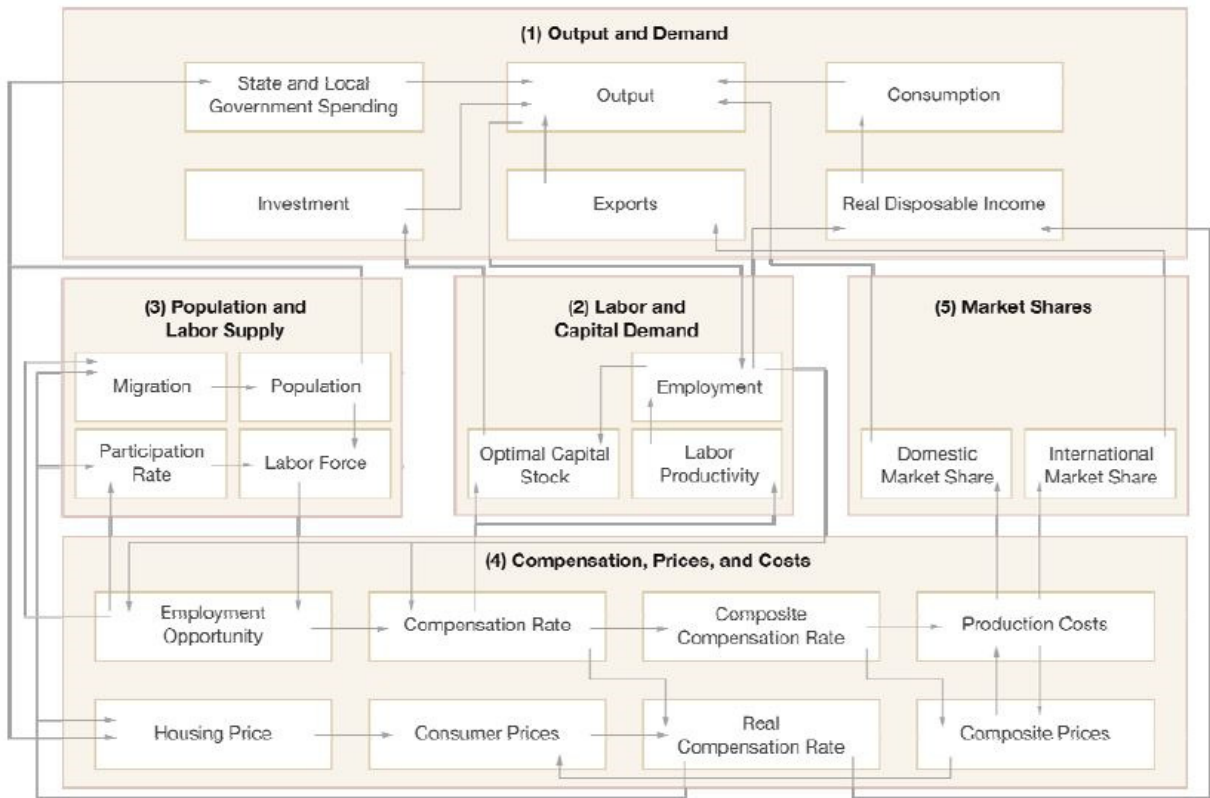
Figure 1. Policy Analysis Using the REMI Model



The difference between the baseline scenario and the simulated scenario constitutes the magnitude of the impact of the Sibanye-Stillwater mine on the state economy, and represents the gains the state is experiencing due to mine operations.

The REMI model utilizes historical data on production, prices, trade flows, migration, and technological advances to calibrate the relationship between five basic blocks of the state economy: 1) Output and Demand; 2) Labor and Capital Demand; 3) Population and Labor Supply; 4) Compensation, Prices and Costs; and 5) Market Shares. These linkages are shown in Figure 2, below.

Figure 2. Schematic Model of REMI Linkages



The differences in production, labor demand, and intermediate demand associated with the absence of the Sibanye-Stillwater mine impact these blocks, causing them to react to the changes and adjust to a new equilibrium. This new equilibrium constitutes the alternative scenario referred to above—the absence of the mine operations.

The underlying philosophy of the REMI model is that regions throughout the country compete for investments, jobs, and people. When events occur in one region, they set off a chain reaction of events across the country that causes dollars to flow toward better investment and production opportunities, followed over time by workers and households toward better employment opportunities and higher wages. The REMI model consists of an 82-sector input/output matrix that models the technological inter-dependence of production sectors of the economy, as well as extensive trade and capital flow data. Together, these components enable the estimates of the shares of each sector’s demand that can be met by local production. Simplified illustrations of the schematic model in Figure 2 are provided on the following pages, in figures 3 through 7.

Figure 3. Output Linkages

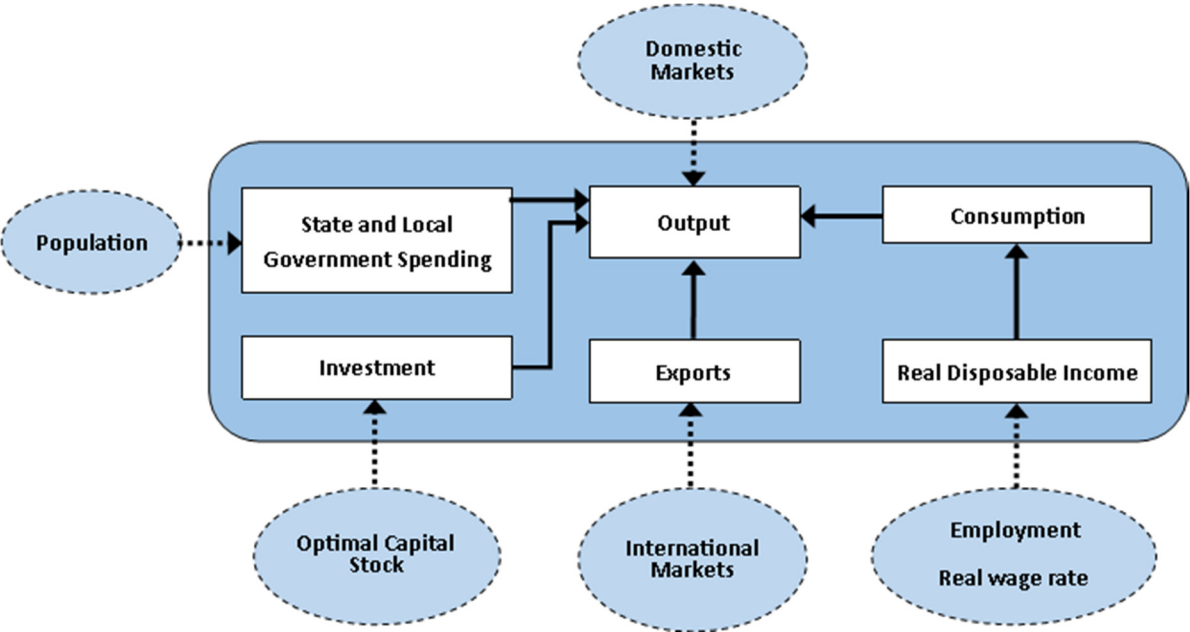


Figure 4. Labor and Capital Demand Linkages

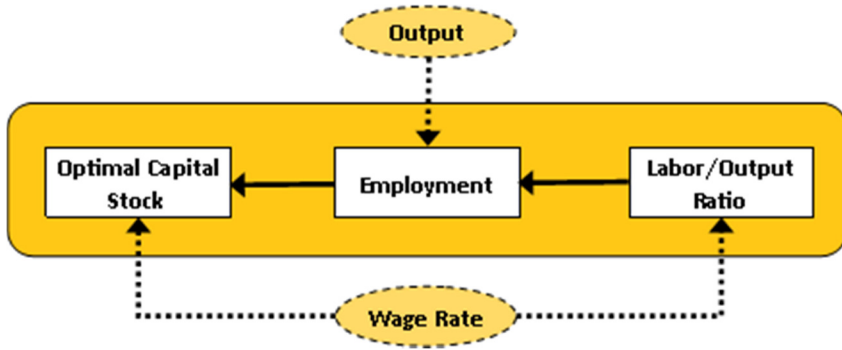


Figure 5. Demographic Linkages

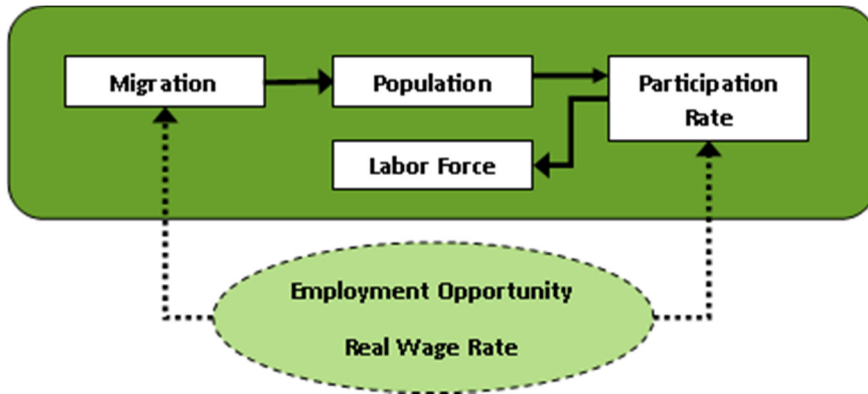


Figure 6. Wages, Prices and Production Costs Linkages

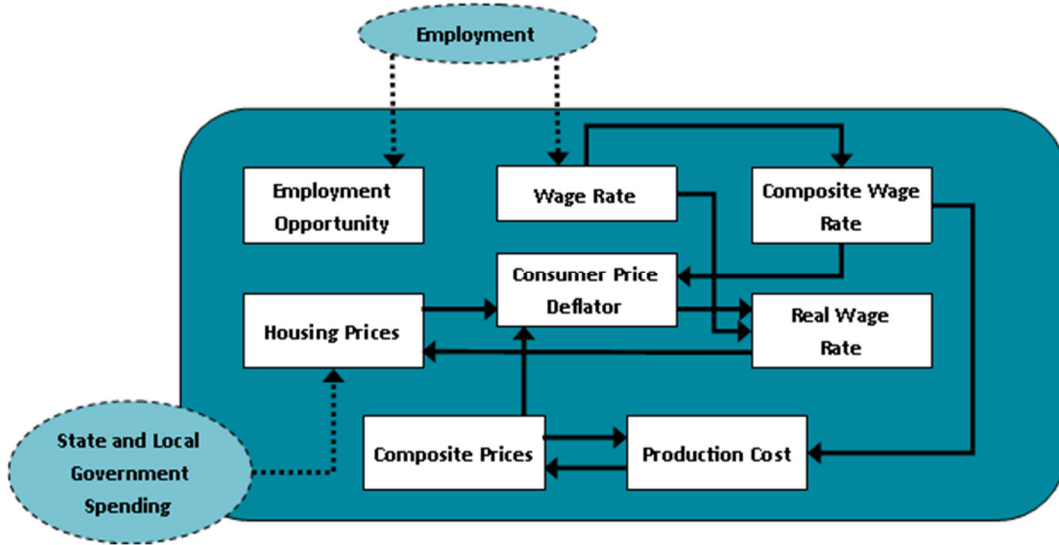
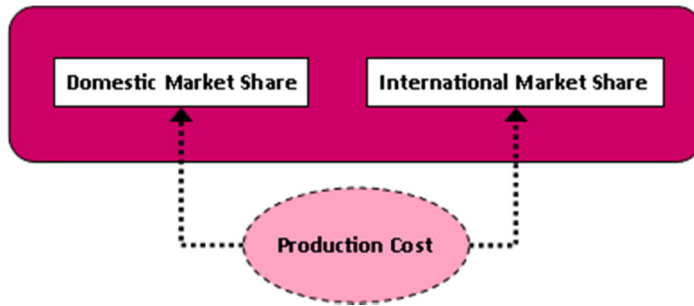


Figure 7. Market Share Linkages



As powerful and flexible as this tool is, the output it provides is only as good as the inputs provided. The majority of the work for this study was to carefully craft the inputs used to construct a scenario for the economy that faithfully represents all of the events, income flows, and the direct and indirect impacts that would not occur in the absence of the Sibanye-Stillwater mine.

3. THE DIRECT ECONOMIC CONTRIBUTIONS OF THE SIBANYE-STILLWATER MINE

The fundamental question addressed by this research is: what would the economy of Montana look like if the Sibanye-Stillwater mining operations did not exist? A comparison of the actual economy and this hypothetical, no-mining operations, economy gives a measure of the total economic contribution of the mining complex. Since the latter cannot be directly observed, it must be constructed with the use of an economic model, which traces the interactions between mining operations and the overall economy, to create a portrayal of economic activity with no mining activity present.

It is useful to break down the total economic impact of Sibanye-Stillwater’s Montana operations into two distinct pieces:

Table 2. Components of Economic Impact

DIRECT IMPACTS	Payroll, vendor purchases, tax payments and other economic flows that come from the operations of the facilities themselves.
INDUCED IMPACTS	Spending, employment, consumption and other economic flows that occur as direct and indirect spending is received by workers, businesses and governments as revenue, and re-spent (to some degree) in the state economy.

In this analysis, the direct impacts are obtained from records obtained from the company. Those are briefly described in this section.

The Sibanye-Stillwater mining facility clearly adds to the economy of south central Montana, as can be seen from the Direct Impacts summary in Table 3. Its more than 1500 employees bring home more than \$170 million annually in spendable income, the company purchases more than \$440 million annually in goods and services, and remits more than \$10 million per year to local governments in property and gross proceeds taxes.

It is important to note that these business activities are purely additive to the existing economy. As a company that serves a global marketplace, the sales of PGM products do not compete with other local businesses, as might be the case for, say, a restaurant or a hotel.

We now move on to the central question of this study, namely, how does overall economic activity in the state respond – and add to – the spending and production of Sibanye-Stillwater?

Table 3. Direct Economic Impacts of Sibanye-Stillwater

DIRECT ECONOMIC IMPACTS BY CATEGORY	
Number of employees	1,505
Total Payroll	\$182,850,651
<i>Gross Payroll (including vacation, holiday, sick leave)</i>	\$171,190,603
<i>Payroll Taxes (company's FICS; federal and state unemployment)</i>	\$11,660,048
Total Taxes Paid	\$16,569,361
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Total Purchases	\$441,765,840
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<i>Employee withholding for FICA</i>	\$7,742,887
<i>Employee withholding for Medicare</i>	\$2,549,401

Source: Sibanye-Stillwater, 2017

4. THE ECONOMIC IMPACT OF THE SIBANYE-STILLWATER MINING COMPLEX IN MONTANA

This analysis considers two economic scenarios for the state of Montana. The baseline scenario has the Sibanye-Stillwater complex operating at current levels, while the alternative scenario assumes the absence of all operations at the mining complex. The projection for the absence of mining operations is made based on the changes described in the previous section—the direct impacts—in an economic model which assesses how those changes affect the rest of the state economy. The difference between the baseline and the alternative scenarios is the total impact of the Sibanye-Stillwater mine.

We present the comparison of the two scenarios – the economic contribution of Sibanye-Stillwater mining operations in Montana – in this section.

Results Summary

The basic finding of our analysis is that the mining operation of Sibanye-Stillwater in south central Montana make the economy of the state significantly larger, more populous, and more prosperous. The 1,505 jobs, \$182 million of payroll spending, and \$441 million of vendor purchases made by the company each year ultimately produce a state economy where

- Employment is higher by 5,995 more jobs,
- Income received by Montana households each year is more than a half billion dollars higher,
- Tax and non-tax revenues received by state government are \$95 million higher,
- The output (value-added) of Montana business and non-business organizations is more than \$1.5 billion higher each year, and
- Nearly 11,000 more people call Montana home.

Table 4. Economic Contributions of Sibanye-Stillwater: Summary

CATEGORY	IMPACT
Total employment	5,995 jobs
Personal income	\$500.9 million
<i>Disposable personal income</i>	<i>\$438.0 million</i>
Tax and non-tax revenues	\$94.7 million
Output	\$1,556 million
Population	10,724 people

These contributions highlight the strong linkages that exist between the operations of the mine and mineral processing facilities and the rest of the state economy.

A more detailed examination of the economic contributions made by the Sibanye—Stillwater mining operations in Montana reveals additional insights on why the size of these contributions is so substantial. We now turn to a more detailed examination of these impacts.

a. Employment Impacts

While all of Sibanye-Stillwater’s employees are employed in the mining industry, the jobs that are ultimately supported by the company’s mining operations in south central Montana can be found in across a broad spectrum of state industries. The job impacts of other industries are substantial.

Of the 5,995 jobs generated by the Sibanye-Stillwater facilities, approximately 26 percent are in the mining sector. The remaining jobs are spread across the entire spectrum of economic activity, from goods-producing to service-producing industries.

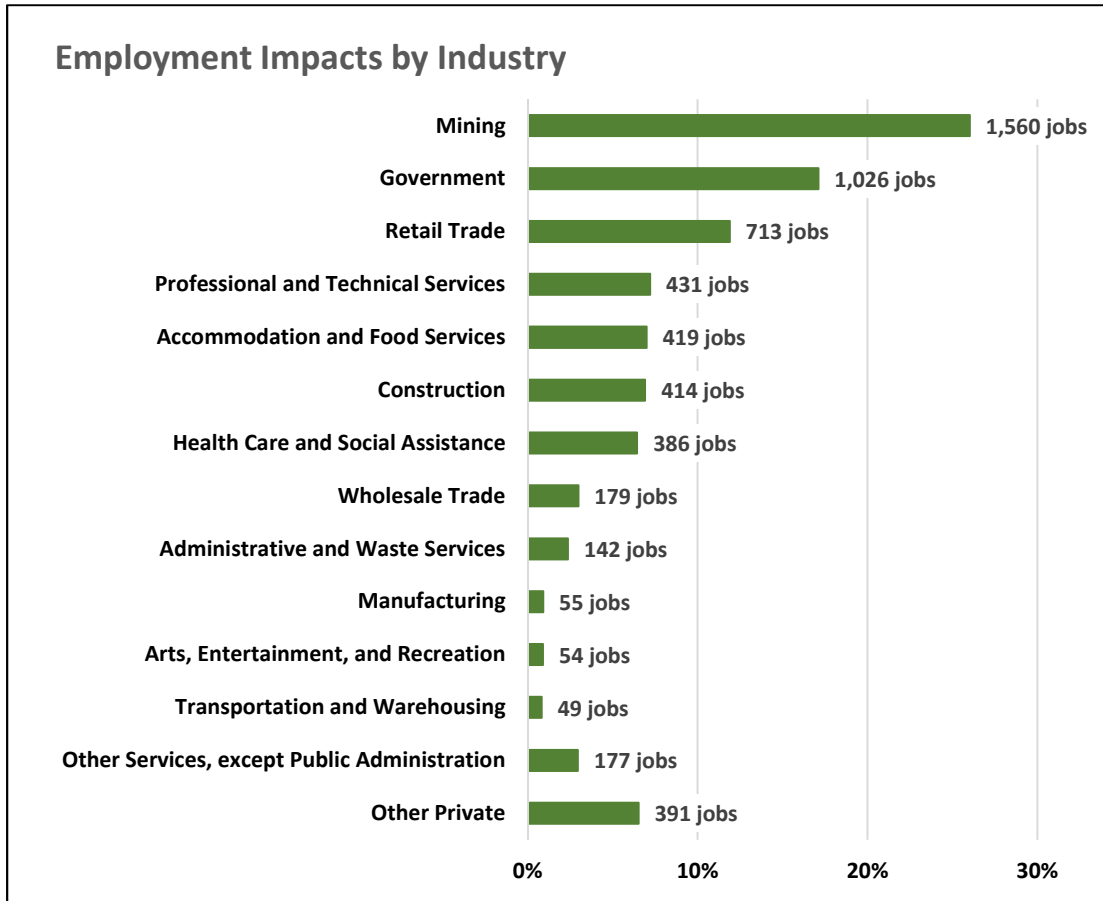
Outside of mining, the largest employment impact occurs in the area of state and local government, where 1,026 jobs are generated by the facilities’ activity. These impact are large because (i) the population is larger with Sibanye-Stillwater present in the economy, increasing demand for public services, especially schools, and (ii) mining industry in general, and Sibanye-Stillwater in particular, make sizable tax payments to state and local governments, supporting government employment.

The gains in unrelated industries, such as health care and retail trade, that are ultimately due to the presence of Sibanye-Stillwater in the economy come about from the spending of households, businesses and governments who receive income from the company. As can be seen form Table 5 and Figure 8, those gains are substantial.

Table 5. Economic Contributions of Sibanye-Stillwater: Employment Impacts

TOTAL EMPLOYMENT IMPACTS BY INDUSTRY	IMPACT
Mining	1,560
Government	1,026
Retail trade	713
Professional and technical services	431
Construction	419
Wholesale trade	414
Health care and social assistance	386
Accommodation and food services	197
Administrative and waste services	142
Manufacturing	55
Transportation and warehousing	49
Arts, entertainment and recreation	54
Other services, except public administration	177
Other private	391
TOTAL	5,995

Figure 8. Economic Contributions of Sibanye-Stillwater: Employment Impacts



b. Personal Income and Compensation Impacts

Another dimension of the contributions made to the state economy by the operations at Sibanye-Stillwater is the income received by Montana households. The larger economy that exists because of the company's mining operations in south central Montana translates into more income, which in turn fuels some of the spending that supports the job gains described in the previous section.

Wages and salaries received by payroll workers accounts for roughly 60 percent of the more than \$500 million in additional income received by Montana households each year which is ultimately due to the presence of Sibanye-Stillwater in the economy. These increases occur because the number of jobs in the economy is higher due to the company's operations. Adding the \$57.6 million paid by employers each year in benefits, plus the \$20.3 million in business owner income brings the total earnings impacts of Sibanye-Stillwater to \$435.4 million annually.

The detail on income impacts show in Table 6 shows that in the larger economy that occurs due to the presence of Sibanye-Stillwater in the state, all forms of income are affected. This includes the \$64.5 million in property income and \$69.5 million in income from government transfers that would appear to have little relation to mining operations, yet come about as higher population and income levels occur due to the presence of mining operations in the economy.

One of the most important factors in explaining the sizable impacts that occur in the overall economy that are due to the operations of Sibanye-Stillwater is the high-paying nature of the jobs the company offers. This translates into considerable spending power of its workers. Of all the jobs – both direct and induced – that exist in the state economy because of the presence of Sibanye-Stillwater, the average earnings per job is \$72,626 per year, as shown in Table 7. This includes not only jobs in mining, but also in retail trade, health care, government and all the other industries where employment gains take place. This figure is 63 percent higher than the overall average earnings for all jobs in Montana, which was \$44,470 in 2017.

Table 6. Economic Contributions of Sibanye-Stillwater: Personal Income Impacts

CATEGORY	IMPACT
EARNINGS	\$435.4 million
<i>Wages and salary disbursements</i>	<i>\$323.5 million</i>
SUPPLEMENTS TO WAGES AND SALARIES	\$91.6 million
<i>Employer contributions for employee pension and insurance funds</i>	<i>\$57.6 million</i>
<i>Employer contributions for government social insurance</i>	<i>\$34.0 million</i>
<i>Proprietors' income w/inventory valuation and capital consumption adjustments</i>	<i>\$20.3 million</i>
LESS: Contributions for government social insurance	\$63.3 million
Employee and self-employed contributions for government social insurance	\$29.3 million
Employer contributions for government social insurance	\$34.0 million
PLUS: Adjustment for residence	(\$5.2 million)
Gross in	\$1.3 million
Gross out	\$6.5 million
EQUALS: Net earnings	\$366.9 million
PLUS: Property income	\$64.5 million
Dividends	\$19.6 million
Interest	\$33.5 million
Rent	\$11.3 million
Transfer payments	\$69.5 million
EQUALS: Personal Income	\$500.9 million
LESS: Personal current taxes	\$62.9 million
DISPOSABLE PERSONAL INCOME	\$438.0 million

Table 7. Economic Contributions of Sibanye-Stillwater: Compensation Impacts

INDUSTRY	IMPACT
Wages and Salaries	\$323.5 million
Compensation	\$415.1 million
Earnings	\$435.1 million
Earnings per Job, New Jobs	\$72,626

c. Output Impacts

A larger state economy has more jobs and income, and also produces more in output. Detail on how the \$1.5 billion in additional economic output – defined as value-added – that is due to the presence of Sibanye-Stillwater in the economy is distributed across Montana industries reveals more insights about the linkages between the company’s mining operations and the rest of the economy.

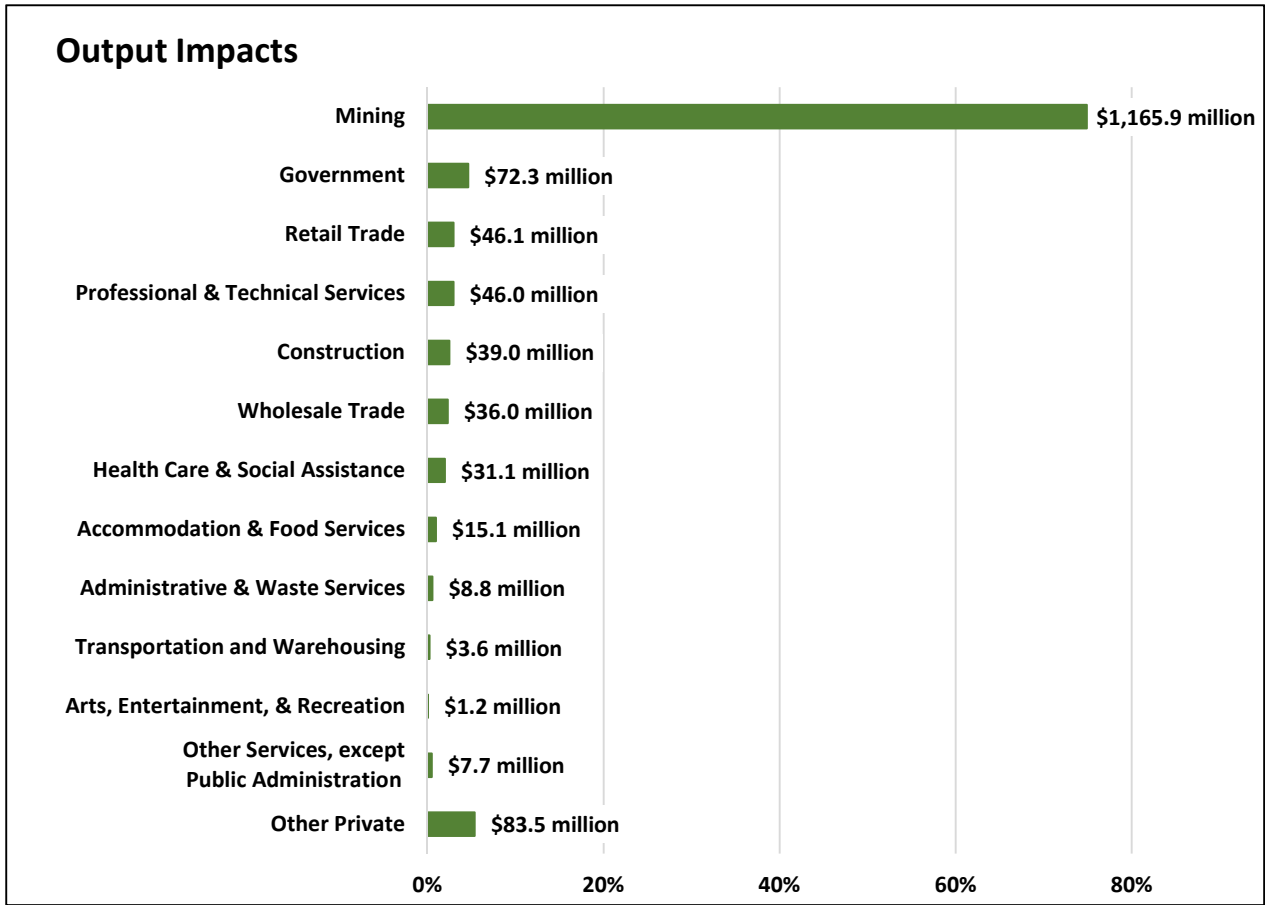
The output impacts associated with the mine operation also reveal a pattern of broad impacts across the entire economy, as shown in Table 8. The distribution of output impacts across industries is more heavily concentrated in mining itself than was the case for employment impacts. This is because of the highly capital intensive nature of mining. Additional significant impacts can be seen in the areas of construction, state and local government, retailers, and real estate and leasing companies. Increases in sales reflect both consumer and non-consumer spending.

The addition of income across the economy produces increased sales and outputs for Montana businesses and non-business organizations. An additional component is the business-to-business commerce that is also affected by the operation of the Sibanye-Stillwater mine complex. An examination of these impacts illustrates how Montana business owners and operators benefit from the mine.

Table 8. Economic Contributions of Sibanye-Stillwater: Output Impacts

INDUSTRY	IMPACT
Mining	\$1,165.9 million
Government	\$72.3 million
Retail trade	\$46.1 million
Professional and technical services	\$46.0 million
Construction	\$39.0 million
Wholesale trade	\$36.0 million
Health care and social assistance	\$31.1 million
Accommodation and food services	\$15.1 million
Administrative and waste services	\$8.8 million
Transportation and warehousing	\$3.6 million
Arts, entertainment and recreation	\$1.2 million
Other services, except public administration	\$7.7 million
Other private	\$83.5 million
TOTAL	\$1,556.3 million

Figure 9. Economic Contributions of Sibanye-Stillwater: Output Impacts by Industry



d. Population Impacts

Increased employment opportunities in Montana because of Sibanye-Stillwater bring about increases in population. These occur both from those in other states who move to Montana to pursue employment, or from those who already live here who might have migrated elsewhere.

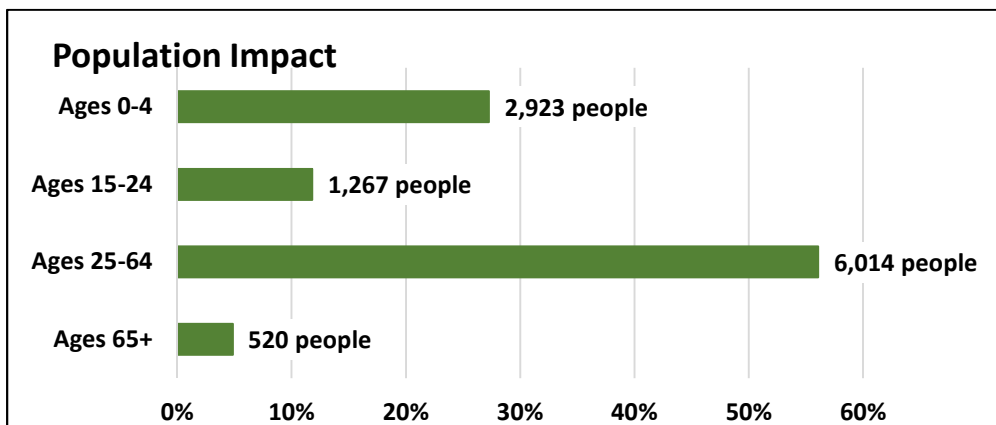
The population impacts due to the presence of Sibanye-Stillwater are dominated by working age adults and their children, as seen from Table 9. The population increase that is caused by the continued operations of the mining facilities creates demand for public services, especially public schools.

A total population impact of fewer than 11,000 people may appear modest in a state with well over 1 million residents. However, with a preponderance of impacts occurring in the sparsely populated counties of Stillwater and Sweet Grass in the east-central portion of the state, they are more significant than this comparison suggests. In this part of the state, the impact on the population constitutes more than 80 percent of the total (U.S. Census Bureau, 2017).

Table 9. Economic Contributions of Sibanye-Stillwater: Population Impacts by Age Cohort

AGE COHORT	POPULATION IMPACT
Ages 0-14	2,923
Ages 15-24	1,267
Ages 25-64	6,014
Ages 65+	521
TOTAL	10,724

Figure 10. Economic Contributions of Sibanye-Stillwater: Population Impacts by Age Cohort



e. State Revenue Impacts

A larger economy also creates a larger tax base. And a hard-rock metal mining operation has more impact on state and local tax revenues in Montana, for at least two reasons. The first is the capital intensive nature of mining, which presents a more sizable increase in the property tax base than, say, a services company. The second is the high reliance of the state of Montana on natural resource activities in general, and hard rock mining in particular, as a source of state revenues.

In addition to federal taxes that most Montana companies pay that are largely lost to the Montana economy, hard rock mining companies like Stillwater-Sibanye pay:

- A metal mines tax based on the gross value of the commodity,
- A net proceeds property tax based on tons produced times a statutory value of the commodity adjusted for an annual inflation factor that is remitted to the state,
- A gross proceeds property tax based on the gross value of the commodity less allowable deductions that is distributed to the taxing jurisdiction where the production occurred,
- Property taxes on other types of property owned by the mine, such as land holdings, commercial property, pollution control equipment and business equipment, and
- Corporation income tax based on income earned in the tax year.

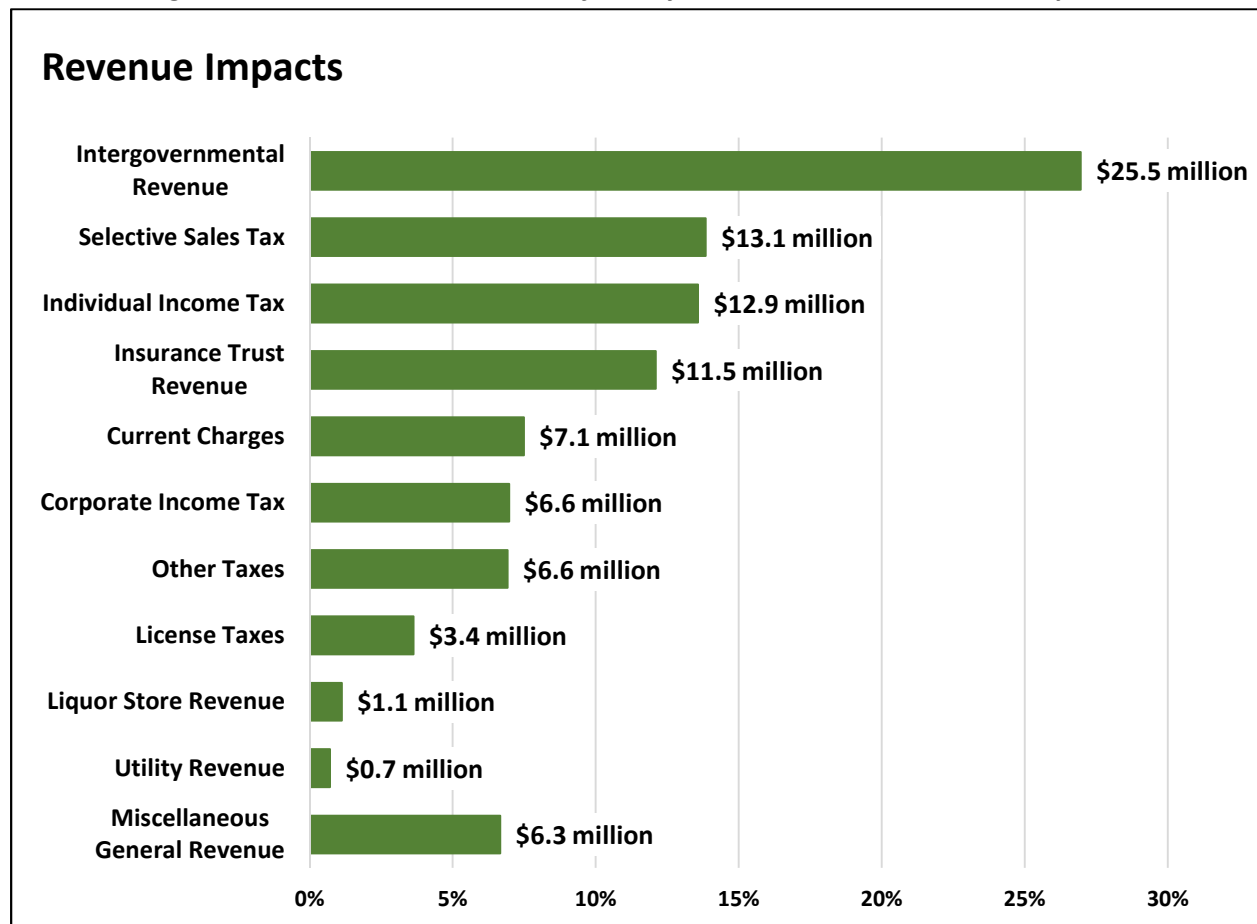
Table 10. Economic Contributions of Sibanye-Stillwater: State Revenue Impacts

REVENUE IMPACTS BY CATEGORY	IMPACT
Intergovernmental revenue	\$25.5 million
Selective sales tax	\$13.1 million
Individual income tax	\$12.9 million
Insurance trust revenue	\$11.5 million
Current charges	\$7.1 million
Corporate tax	\$6.6 million
Other taxes	\$6.6 million
License taxes	\$3.4 million
Liquor store revenue	\$1.1 million
Utility revenue	\$0.7 million
Miscellaneous general revenue	\$6.3 million
TOTAL	\$94.7 million

With company operations ultimately accounting for more than \$500 million in additional personal income each year, as well as \$1.5 billion in economic output, it is clear that the impact of company operations on tax revenues extends far beyond those paid directly by the company. Those revenue impacts (which include all tax and non-tax revenues received by state government) are presented for 11 major revenue categories in Table 10. These categories correspond to those used by the Census of Governments.

Our finding that almost \$95 million in revenues would be lost to state government if Sibanye-Stillwater was not a part of the Montana economy reveals the strong linkages between company operations and the financial health of state government. As can be seen from the Table as well as Figure 11, the largest category of lost revenues consists of transfers from the federal government. These reflect everything from highway funding to Medicaid, and largely reflect the lower population that would exist if the mining complex did not exist. Some of the revenue categories, such as individual income tax revenues, reflect taxes that are directed towards Montana General Fund expenditure. Other categories are earmarked for specific purposes.

Figure 11. Economic Contributions of Sibanye-Stillwater: State Revenue Impacts



5. CONCLUSION

There are three distinct approaches one could take in achieving an understanding of the importance of Sibanye-Stillwater mining operations in south central Montana to the economy of the state. The first is to consider the value of what the mine produces – the palladium, platinum, and other precious metals that are of critical importance in a wide range of industrial and consumer products, including the catalytic converters in motor vehicles that give us cleaner air.

A second approach is to consider the mining complex as an employer, providing jobs that pay more than double the average earnings per job in Montana, outside of the more heavily urbanized parts of the state that arguably provide more economic opportunities.

A third approach is to consider the value of the company operations to the state's tax base, especially since natural resource producers in Montana pay a larger share of taxes than other businesses.

In this study we have focused on the second and third approaches. We ask and answer the basic question: what would the economy of the state of Montana look like if the operations of Sibanye-Stillwater in south central Montana did not exist? Because we do not take into account the substantial benefits of the company's products to Montana, we doubtless undercount – perhaps substantially – the benefits of the mining operations to the state. But even with this omission, the economic activity that we find is ultimately supported by the operations of the state's largest hard rock metal mine are substantial.

Our basic finding is that the company's operations in Stillwater and Sweet Grass Counties support the economic livelihoods of businesses, households, and governments to a degree that is much larger than its own payroll, spending and tax payments would suggest. The 1,505 workers who are employed at the company's three facilities in south central Montana ultimately cause the Montana economy to be larger by:

- Almost 6,000 permanent, year-round jobs, with averaging \$72,626 in annual earnings,
- More than a half billion dollars per year in terms of income received by Montana households, of which \$438 million represents after-tax income available for local spending,
- More than \$1.5 billion in terms of economic output, the value added production of goods and services across the entire spectrum of industries in the state economy,
- \$95 million per year in state revenues which result from the larger economy, population, and tax base, and
- 10,724 in increased population, retained and attracted by the economic opportunities created by higher levels of economic activity.

There are several reasons why the operations of Sibanye-Stillwater in south central Montana continue to have an outsized impact on the economy as a whole. The first is the high earnings enjoyed by its workforce. In 2017, the 1,505 workers at the three Sibanye-Stillwater facilities in Stillwater and Sweet

Grass Counties earned an average of \$113,748 per year. This average pay, which is more than two and a half times as large as the state average, translates into significant purchasing power in support of other Montana jobs. A second reason is the significant tax contributions made by all natural resource producers in Montana, owing to the state's increased dependence on those producers in its tax base.

Finally, the hard rock mining industry in general, and Sibanye-Stillwater in particular, has a high fraction of "made in Montana" product as part of its input stream. That is, the rock and ore from Montana that contains the mining products it produces. Its extraction, concentration, and smelting processes turn that into products of considerable economic value.

The conclusion of this study is that the operations of Sibanye-Stillwater in south central Montana bring about a state economy that is significantly larger, more prosperous, and more populous than what would exist if it were not present.

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