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Abstract

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JEL-Classification: L72, O12, O13, Q32, R11

Keywords: Mining, Natural Resources, Regional Economy, and Economic Development

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1. Introduction

Extractive industries can accelerate the economic advancement of mineral-dependent developing nations (Sachs and Warner, 1999; Smith, 2015).[1] The process, however, is not automatic and depends on many economic and non-economic factors. The economic factors include commodity price movements and inflows of foreign direct investment (FDI) (Auty, 2001; Van der Ploeg, 2011; Venables, 2016; Cassidy, 2019). Mining exports may also affect exchange rates, which can adversely impact the non-resource sectors of the economy (Smith, 2019). Among the non-economic factors, resource-revenue management, implementation of the rule of law, level of corruption, degree of economic freedom, characteristics of the political regime, and institutional strength are critical for resource-rich countries' growth trajectories (Halvor et al., 2006; Bhattacharyya and Hodler, 2010; Bhattacharyya and Collier, 2014). Thus, certain circumstances can affect the economic growth of mineral-dependent countries (Sachs and Warner, 1999).

Even when the extractive industry production enhances national economic growth at the macroeconomic level, communities affected by mining are not guaranteed to benefit (Cust and Poelhekke, 2015; Van der Ploeg and Poelhekke, 2017). For example, the pollution generated by mineral extraction and processing may negatively affect nearby households' health and well-being (von der Goltz and Barnwal, 2019). The concentration of the mining profits among few elites can exclude local people from the positive economic gains, which may also jeopardize the community's welfare in the long-run (Lane and Tornell, 1996; Dell, 2010). Therefore, examining the impact of resource extraction at both local and household level can help us better understand the welfare outcomes from mining (Cust and Poelhekke, 2015; Van der Ploeg and Poelhekke, 2017). We investigate the local welfare effects of a large-scale copper-gold mine in Mongolia, a mineral-dependent, lower-middle-income country. We find that responsible mining activities support local communities, and contribute to the nascent literature on extractive industries' local effects by providing new empirical evidence.

[1] Haglund (2011) defines a country as mineral-dependent if it generates at least 25 percent of export earnings from minerals. Based on this definition, the number of mineral-dependent low and middle-income countries, including Mongolia, stood at 61 in 2010. There are other definitions of mineral dependency. For example, Auty (1993) defines a nation as mineral-dependent if it generates at least eight percent of Gross Domestic Product (GDP) and 40 percent of export earnings from minerals.

Natural resource extraction appears to have both beneficial and adverse impacts on local communities in advanced economies. The oil extraction affected the employment, educational attainment, and per capita income positively in oil-rich counties of the southern US (Michaels, 2011). A decade of natural gas development in the south-central US created jobs and increased earnings per job (Weber, 2014; Allcott and Keniston, 2017). Mining regions in Australia had lower income inequality than the non-mining and non-metropolitan areas as new mining jobs increased employment in other sectors through local multiplier effects (Fleming and Measham, 2015). Similarly, energy extraction in Western Canada created jobs in construction, retail, and service sectors during boom periods (Marchand, 2012). Conversely, mining suppressed income growth, and the number of high school drop-outs increased in coal-dependent counties of the US (James and Aadland, 2011; Douglas and Walker, 2017).

Evidence from resource-rich developing countries is also mixed. For example, copper mines in Zambia, where fiscal links are weak, created solid backward linkages to local markets, resulting in positive impacts on household expenditure, housing conditions, and the ownership of consumer durables (Lippert, 2014). The real incomes of residents around a large-scale gold mine in Peru rose because of the mine's backward linkages to local markets (Aragón and Rud, 2013). Also, mining districts in Peru had higher consumption per capita and lower poverty rates than the non-mining communities, but consumption inequality was higher within mining districts (Loayza and Rigolini, 2016).

The consumption of households living near artisanal gold mining sites in Burkino Faso increased significantly during the gold boom period (Bazillier and Girard, 2020). Localities near oil fields in Brazilian municipalities experienced a higher level of per capita income (Gradstein and Klemp, 2020). Similarly, oil and gas production in district government areas in Indonesia increased real income per capita in those districts (Hilmawan and Clark, 2019). In various Sub-Saharan African countries, mining development occurred in enclaves as living standards improved only in the host districts (Mamo et al., 2019).

On the other hand, some developing countries experienced a negative outcome from mining development. For example, in Ghana, the pollution from a gold mine reduced agricultural workers'

productivity and increased rural poverty (Aragón and Rud, 2015). Because of officials' rent-seeking behavior in Brazil's oil-rich municipalities, living standards did not improve despite oil companies' increased investment in infrastructure, education, and health facilities (Caselli and Michaels, 2013). Ahlerup et al. (2020) also found that educational attainments of adults who lived near gold mines during their adolescence were significantly lower in most countries across Africa due to the higher incidence of child labor in the mining sector. Therefore, mining activities do not necessarily lead to positive development outcomes for nearby communities.

In addition to the outcomes mentioned above, mining depletes non-renewable resources, grabs farmland and pastureland, redirects rivers and streams, and leaves irreversible environmental footprints. The historically widespread conflicts between indigenous people, local communities, and mining companies resulted in the recent shift in mining companies' uptake of corporate social and environmental responsibility (Jenkins, 2004). Mining corporations usually seek to mitigate the adverse externality effects through their corporate social responsibility (CSR) activities, including monetary and in-kind donation, community development programs, and financial compensation (Reinhardt et al., 2008).

The community relationship between mining companies and local stakeholders, which is sometimes not smooth, plays an essential role in shaping the development outcomes (Jenkins, 2004). When negotiation and consensus between mining companies and local communities are reached, both parties win: mining operations continue without disruption, and local people in the proximity of mining benefit from CSR initiatives (Otto, 2010). However, besides the traditional benefits, whether CSR activities and investment resulting from mining activities affect household consumption patterns and decisions is unclear.

Our study is the first to use CSR spending as a proxy for mining activities. We empirically examine the causal relationship between early-stage, large-scale mine development and household welfare in a developing country. Specifically, we investigate the impact of an exogenous shock - resource discovery and a significant inflow of foreign direct investment - on households' welfare in a mining region. Previous studies such as Caselli and Michaels (2013); Aragón and Rud (2015); Mamo et al. (2019); Gradstein and Klemp (2020) have used windfall revenues, mining production,

local taxes, procurement, and proximity to oil fields to examine the impact of natural resource extraction. We employ CSR spending as it captures the overall impact of mining activities and the effect of CSR activities on household consumption decisions.

We undertake both macroeconomic and microeconomic analyses to draw a complete picture of the mining sector's impact at the local level. First, we employ a three-variable Vector Autoregressive (VAR) model to examine the mining sector's contribution to the provincial economy. We then use a difference-in-differences (DD) model in a quasi-experimental setting, with data from four recent Mongolia Household Socio-Economic Survey (HSES) rounds. Our analysis focuses on household consumption patterns to examine the local welfare effects of mining activities.

We find that a 10 percent increase in CSR spending resulted in 2.2, 2.3, and 1.9 percent increases in income, food consumption, and non-food consumption, respectively. Therefore, the mining activities positively impact households' incomes and consumption in a region currently typified by limited economic and social opportunities and infrastructure. A detailed analysis of consumption, including expenditures on food, health, education, energy, clothing, and transportation, further supports the idea that mining activities benefit the local population.

The rest of the paper proceeds as follows. Section 2 provides background to the study. Section 3 discusses the empirical strategy and data. Section 4 presents the main results and discusses the associated policy implications. Section 5 concludes the paper.

2. Background

2.1. Mongolia and its dependence on minerals

In 2012, CNN reporter Amanpour asked, "What is the world's fastest-growing economy? If Mongolia did not pop into your mind, you are probably not alone."[2] Mongolia is a lower-middle-income nation with a small, open economy, which relies on minerals, including coal, copper, iron ore, and zinc. The extractive industries received more than 75 percent of foreign direct investment (FDI) during 2011-2016 (NSO, 2019). In 2016, the highest value exports were copper ore ($1.61b),

[2]See https://cnn.it/3aPZ8b2.

gold ($1.53b), and coal briquettes ($987m).[3] The mining sector comprised 18 percent of GDP, 63 percent of total exports, and 19 percent of government budget revenue in 2016. Also, the mining sector employed three percent of the country's workforce in 2016 (NSO, 2019). This and other country analysis (e.g., Baatarzorig et al., 2018) indicates the economy's reliance on the resources sector.

Economic growth in Mongolia topped 17 percent in 2011 as FDI poured in with the expectation of substantial returns from mineral development. Average economic growth was 7.5 percent per annum from 2000 until the Global Financial Crisis (GFC), when the economy contracted by 1.3 percent in 2009. The economy recovered quickly with China's increased demand for minerals, which underpinned a rapid increase in FDI and high commodity prices, leading to a mining boom between 2010 and 2013 and substantial structural changes in the economy (IMF, 2011; Maino et al., 2013; Doojav and Luvsannyam, 2019).

The mining sector generates windfall revenues and contributes substantially to public finances through various taxes, including royalties, license fees, and corporate income.[4] The central government manages the windfall revenues and makes allocations to the provinces for different purposes. The government projected that in 2019 it would source 27 percent of Mongolian consolidated total budget revenue from mining revenues.[5] Provinces with large-scale mineral deposits generate substantial tax revenues, with most transferred to the central government's consolidated budget. These transfers support an inclusive development agenda with the view that mineral resources belong to all Mongolian citizens and, therefore, all should benefit equally from the mining development. Mining provinces do not receive additional grants from the central government to finance

[3] We used m and b to refer million and billion, respectively, while $ refers to the US Dollar. US Dollar's exchange rate in local currency, Mongolian Tugrik (MNT), was MNT1,229 in 2008 and MNT2,483 in 2016.

[4] Mining license holders in Mongolia need to pay a standard royalty based on the total sales value of the minerals, ranging from 2.5 percent for coal to 5.0 percent for commonly exported minerals. Additional tax categories include personal income tax, corporate income tax, value-added tax, real estate tax, water consumption tariff, land use fee, import duty, customs duty, excise tax, and taxes for foreign specialists' employment (Mineral Resources and Petroleum Authority, 2016). Either provincial or central government collects these taxes.

[5] Ten and 36 percent of the mining revenues would be transferred to the Stabilization Fund (SF) and the Future Heritage Fund (FHF), respectively. The SF and FHF, established in 2010 and 2016, respectively, act as counter-cyclical policy tools and create sustainable funds by saving resource revenues. The SF contributes to intra-generational equity, while the FHF underwrites inter-generational equity (Vanchin, 2018).

their local administrative expenses. However, the central government funds national-level public projects (Vanchin, 2018).

2.2. Impacts of mining: sub-national differences

We first examine the mining sector's impact at the sub-national level before undertaking our main analysis at the household level. Following the definition of Auty (1993) for a resource-rich country, we categorize nine provinces as resource-rich, mining provinces as at least eight percent of their annual provincial GDP comes from the mining sector for the period 2010-2018.[6] The remaining 12 are classified as non-mining provinces. Appendix A.1 presents the list of provinces with the categorization.[7] We examine the sub-national effects, reflecting the importance of mining sector production to provincial economies, through the following three-variable vector autoregressive (VAR) process, separately for mining and non-mining provinces:

$$Y_{i,t} = A + B \times Y_{i,t-1} + e_{it} \tag{1}$$

where,

$$Y_{i,t} = \begin{bmatrix} Y^1_{i,t} \\ Y^2_{i,t} \\ Y^3_{i,t} \end{bmatrix}, \quad A = \begin{bmatrix} a_{10} \\ a_{20} \\ a_{30} \end{bmatrix}, \quad B = \begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{bmatrix}, \quad e_{it} = \begin{bmatrix} \varepsilon^1_{i,t} \\ \varepsilon^2_{i,t} \\ \varepsilon^3_{i,t} \end{bmatrix},$$

and $Y^1_{i,t}, Y^2_{i,t}, Y^3_{i,t}, a_{m0}, a_{mn}$, and ε^m indicates the natural logarithm of mining sector's production, GDP and government revenue, intercepts, coefficients, and error terms, respectively. We use provincial annual macroeconomic panel data on per capita basis available for the period 2010-2018.

We identify our VAR using a Cholesky decomposition to create the impulse response functions (IRF). Specifically, we are interested in studying the impact of mining sector's production shock on itself, GDP and government revenue.[8] Figure 1 shows the IRF for mining sector production,

[6] We excluded the capital city Ulaanbaatar from the analysis because it is a separate urban area that is different from all provinces in terms of market size, population, and economic structure.

[7] Both large and small-scale mining activities take place across Mongolia. The mining sector's production comprises at least 40 percent of the provincial GDP in provinces where large-scale mining occurs. In contrast, mining activities make up less than five percent of provincial GDP in other provinces without large-scale mines (NSO, 2019).

[8] The Cholesky decomposition constrains the VAR system such that the shock ($\epsilon^3_{i,t}$) from the least contemporaneously exogenous series ($Y^3_{i,t}$) has no direct effect on the most contemporaneously exogenous series ($Y^1_{i,t}$), while forcing

GDP, and government revenue, to a one standard deviation shock in the mining sector production. Panel (a) relates to the mining provinces. The top graph shows the response of the mining sector production to its one standard deviation shock. The mining sector production increases by 0.45 percent in the same year, then declines up to year four, increases up to year six, and reaches long-term stability after year eight in response to this shock. GDP increases by a little more than 0.1 percent in year one, grows in the second year and then the response is insignificant to the mining sector production shock in the next graph. Although the mining sector production shock increases the provincial government revenue up to year four, the effect is not significantly different from zero. Overall, a shock in the mining sector production has positive effects on GDP and government revenue in the mining provinces in the short-run.

[Figure 1]

Panel (b) in Figure 1 shows the IRF for the non-mining provinces. In the top graph, the mining sector production increases by 0.8 percent to its one standard deviation shock in the same year, remains negative after year two until year four and becomes insignificant after that. The response is higher in non-mining provinces compared to the mining provinces due to the unstable and volatile nature of the mining sector in non-mining provinces. However, provincial GDP and government revenue drop by less than 0.02 percent and more than 0.1 percent, respectively, in year one and stay around zero. Overall, mining sector production does not significantly affect GDP and government revenue in non-mining provinces. Taken together, the VAR model results indicate that the mining provinces predominantly realize the benefits from mining activities.

2.3. Oyu Tolgoi mine and its CSR activities

Large-scale mines in Mongolia are strategically critical mineral deposits that will either impact national security and economic and social development or have the resource reserves and the

a significant asymmetry on the system (Sims, 1980; Enders, 2010). Our ordering of variables from contemporaneously most exogenous to least exogenous is the following. Changes in provincial GDP per capita are likely to influence the government revenue collection due to tax implications. However, it is unlikely that changes in revenue collected by the provincial government have an instantaneous effect on the GDP per capita. All series are in their natural logarithms and first differenced to satisfy the stationary condition. We performed panel unit root tests for serial correlation. The Johansen test results, available from the author upon request, confirm that the three variables are not cointegrated and meet the VAR model requirement.

capacity to produce more than five percent of the country's annual GDP (Parliament of Mongolia, 2006). Southgobi, the host of a recently discovered copper-gold deposit in Mongolia, is a large-scale mining province examined in this study.[9] Copper, which accounted for over 30 percent of total export value during 2001-2016, is the country's most important mineral. With 31.3m tonnes of copper reserves and 3.3b tonnes of mineable copper ore reserves, Oyu Tolgoi is one of the five largest copper deposits in the world (Oyu Tolgoi, 2018). Oyu Tolgoi's production in mid-2013 increased the volume of copper concentrate exports of Mongolia, from an average of 0.5m tonnes during 1995-2013 to 1.4m tonnes in 2014 (Figure 2). The mine's annual production is projected at 0.43m tonnes of copper and 0.42m ounces of gold for the next 20 years (Rio Tinto, 2019). Oyu Tolgoi's mineral reserves and the scale of the investment for its development are unprecedented in Mongolia's history, with its underground and open-pit mining activities expected to boost its GDP when fully operational (Li et al., 2017).[10]

[Figure 2]

The Minerals Law of Mongolia makes it mandatory for mining license holders to establish a Local Level Agreement (LLA) with the local administrative bodies on environmental protection, infrastructure development, and job creation that the mining companies ought to undertake (Parliament of Mongolia, 2006). However, the laws governing CSR activities and institutions enforcing such laws are still weak in developing countries (Reinhardt et al., 2008). Oyu Tolgoi company is one of the few entities that have established LLA and have undertaken CSR activities for community development (Dalaibuyan, 2017).[11]

[9] Southgobi is a host to a wealth of mineral resources, including the largest coking coal deposit, Erdenes Tavan Tolgoi, in Mongolia. The Erdenes Tavan Tolgoi mine, established in 2010, is a state-owned, joint-stock company that redistributes the resources revenues across the country through public shares. Every Mongolian citizen is entitled to 1,072 shares of the Erdenes Tavan Tolgoi mine, and the company produces and distributes washed and processed brown coal to households in Ulaanbaatar (Erdenes-Tavantolgoi, 2021). Therefore, the company engages in nation-wide socially responsible activities. Other medium-sized mining companies also operate in Southgobi, but their scales and the contribution to local development confine to taxes and local employment.

[10] The Mongolian government and Turquoise Hill Resources entered an investment agreement to develop the deposit, which came into effect in March 2010. Oyu Tolgoi, the country's largest foreign-investment project, attracted $6.2B (50 percent of GDP) in FDI in 2010; the second stage of underground mine development, underway since 2016, required a further $5.3B of FDI (Rio Tinto, 2019; Li et al., 2017).

[11] Kitzmueller and Shimshack (2012) provides two definitions of CSR. The first definition is the European Commission as "a concept whereby companies integrate social and environmental concerns in their business operations and

The two aspects of CSR, protecting and improving, are particularly important in the context of mine-impacted communities in resource-rich developing countries. To *protect* society means that companies avert their negative impacts (e.g. pollution) and to *improve* the societal welfare implies that companies benefit society (e.g. community relations) (Carroll, 2015). On the other hand, interest groups such as indigenous people, environmental activists, and non-governmental organizations demand firms to take responsible actions to engage in ethical and responsible behaviors (Kitzmueller and Shimshack, 2012). However, mining companies' CSR activities help both companies and local stakeholders reach a mutually beneficial agreement in which mining companies acquire a 'social license to operate' (World Bank, 2012). On these fronts, mining province residents may enjoy superior welfare and living standards than their counterparts in non-mining provinces due to the mining companies' CSR activities in their locality besides the traditional benefits of mining.

We employ CSR spending as the primary variable to analyze the economic impacts of mining at the local level. We prefer CSR spending to windfall revenues, employee wages, and local taxes. We chose CSR spending because the production and sales data would not completely capture local impacts, many of which occurred during the initial years of mine construction and development in the absence of output or sales. Oyu Tolgoi company started investing substantially in sustainable development when mine construction commenced in 2010. Furthermore, notwithstanding the significant windfall revenues and the number of jobs the company creates, the local economy retains only a small proportion of them. For example, only 20 percent of total employees come from Southgobi province, making employee wages a less critical measure of mining activity in local communities (Oyu Tolgoi, 2018).

Oyu Tolgoi's CSR activities mainly target Southgobi province residents. Households in the neighboring provinces might benefit from various spillover effects, but not directly from CSR spending. Our analysis, therefore, focuses on the Southgobi province (gray shaded area in Figure 3) to examine the impact of large-scale mining activity. We also investigate the neighboring four regions,

their interactions with their stakeholders voluntarily." The second definition is by the World Bank as "the commitment of businesses to behave ethically and to contribute to sustainable economic development by working with all relevant stakeholders to improve their lives in ways that are good for business, the sustainable development agenda, and society at large."

Bayankhongor, Uvurkhangai, Dundgobi, and Dornogobi, otherwise similar to Southgobi, that do not have mines identical to Oyu Tolgoi (diagonal line shaded area in Figure 3).[12]

[Figure 3]

3. Methodology and data

3.1. Empirical approach

We examine our research question in a quasi-experimental setting. Employing the ordinary least square (OLS) can produce biased or inconsistent estimates in the presence of endogeneity that may arise due to the omission of relevant variables in the model (Wooldridge, 2015). The difference-in-differences (DD) model can tackle the endogeneity problem arising from omitting relevant variables (Parmeter and Pope, 2013). As a result, we use the DD model in our analysis. Our empirical specification closely followed the DD model used by Aragón and Rud (2013) and takes the following form:

$$y_{ist} = \delta + \eta_t + \alpha_s + \beta(lnM_t \times D_s) + X_{ist}\Theta + \varepsilon_{ist}, \tag{2}$$

where, y_{ist} is the (natural logarithm of) monthly income per capita (or consumption or specific categories of consumption in separate analyses) of household i ($i = 1, \ldots n$) in province s ($s = 1, \ldots s$) and year t; X_{ist} is a set of control variables (described in subsection 3.2), η_t is the year fixed effects and α_s is the province fixed effects. We consider 2008 as the control period as the CSR spending is almost nil during the period; we categorize 2012-2016 as the treatment period since the CSR spending, although varied, is high during that time. Our analysis excludes 2010 as the CSR spending is low during 2010-11 and only peaked after that.

The exposure variable lnM_t, a continuous variable, is the (natural logarithm of) annual CSR spending. It captures the positive economic effect of mining activity on local households, as we discussed earlier. The central coefficient of interest in the model is β, the DD estimate, which

[12] Comparing the welfare of households in Southgobi against households in neighboring provinces is a more reliable measure than the distance from the mine. The reason is that the CSR activities have a specific objective of supporting sustainable development in Southgobi province.

provides information about the effect of mining activity on the incomes of households living in Southgobi province. In our model, we expect the CSR investments to impact the households in Southgobi positively. Note that some of the effects may occur as a result of the provincial government's fiscal transfers. Thus, CSR will work as a proxy for mining activity in our model.[13]

We consider Southgobi households as the treatment group since they benefit from the CSR activities after the start of the mining operation by Oyu Tolgoi. Households from the four adjacent provinces, Bayankhongor, Uvurkhangai, Dundgobi, and Dornogobi, are considered the control households. Thus D_s in the model is an indicator variable taking the value of one for households living in Southgobi and zero for those in the neighboring provinces.

The identifying assumption for the DD model is that the difference in the outcome variable between the treatment and control households would have remained the same in the absence of mining activity, which started due to exogenous shocks in the global demand for minerals. While we cannot test the assumption directly, we validate our assumption in two ways. First, we graphically show overtime income and consumption patterns for both groups (see subsection 4.2 for detail). Second, we conduct a placebo test, with 2002 data applied in a conventional DD setup.

3.2. Data

3.2.1. CSR spending data

We employ Oyu Tolgoi company's annual CSR spending data acquired from the company's annual CSR reports to use it as a proxy for mining activities. During 2008-2016, Oyu Tolgoi spent $46.7m on CSR activities. For example, $3.6m in 2014 was used to build infrastructure, provide support for local businesses, the health and education sectors, rehabilitate wells and pastureland, and preserve cultural heritage in Southgobi (Oyu Tolgoi, 2018).[14] Since 2015, Oyu Tolgoi allocated

[13] Southgobi province retains some portion of its resource revenues after transferring more than half to the central government for redistribution across the country. Local taxes from the mining sector, including real estate, water, land use, and automobile taxes, are paid to the provincial government every year, in addition to royalties and donations. These taxes rose substantially from $0.2m in 2008 to $7.9m in 2016, following the commencement of OT's open-pit mine operation in mid-2013 (Oyu Tolgoi, 2019).

[14] The support also included activities relating to Community Engagement and Stakeholder Partnership, a Resettlement Action Plan, and a Cooperation Agreement.

$5m per calendar year to the "Gobi Oyu" development support fund (DSF) to support community development.[15]

Figure 4 shows that the CSR spending of Oyu Tolgoi was low during 2008-09 and increased slightly during 2010-11. It rose significantly during 2012-13 and then sharply fell in 2014 before growing again during 2014-2016. The services and infrastructure that the mining companies built with the CSR fund complement public services and amenities provided by the central or local government. Hence, compared to resource-poor provinces, mineral-rich provinces receive additional social investment due to mine development. Figure 4 indicates that people in the mining region are likely to benefit from CSR spending after 2010.

[Figure 4]

3.2.2. Household data

We use data from the HSES in the study. The HSES is a nationally representative cross-sectional survey conducted by the National Statistics Office (NSO) every two years. The survey uses a stratified two-stage sample design based on population figures obtained from the local governments' administrative records. The first stage stratifies the capital city, Ulaanbaatar, and the 21 provinces. The second stage divides the 21 provinces into two substrata: urban – provincial capitals, and rural – small towns and the countryside (NSO, 2019).[16]

We employ data from four rounds of the HSES – 2008, 2012, 2014, and 2016 – with an initial sample of 56,608 households. We retained a total of 10,400 households located in Southgobi and its neighboring provinces – Bayankhongor, Uvurkhangai, Dundgobi, and Dornogobi, and omitted 47 households that did not report any monetary income. Consequently, the final sample included 10,353 households, including 1,901 households for 2008, 2,131 households for 2012, 3,115 households for 2014, and 3,206 households for 2016.

The HSES collects detailed data on various sources of income and food and non-food consumption, including expenditures on health, education, energy, clothing, services, and transportation

[15]However, this allocation is conditional on the continued operation of the mine and the level of mining activity. The company may suspend or terminate the funding if mining stops, while unspent funds or funds that have not been used per the requirements of the DSF may have to be refunded (Rio Tinto, 2019).

[16]The HSES questionnaires and the primary datasets are publicly available from the NSO Census and Survey data catalog and can be obtained using the following link: http://web.nso.mn/nada.

(NSO, 2019). The effect of mining activity on incomes, food consumption, and various non-food consumption components is the primary focus of this paper. Each of the variables relates to household welfare, and we consider them as the dependent variables in equation (2) in sequential analysis. The categorization of non-food expenditures were conducted following previous studies (e.g., Banks et al., 1997; Blundell et al., 2007; Hasan, 2016). The main categories of expenditures analyzed in this study are medical, education, energy, clothing, services, and transportation.

Table 1 reports the summary statistics for the dependent variables (values are CPI-adjusted at the 2010 level) for treatment and control households by the survey year. We observe a steady increase in monthly income per capita for both groups in all years, except for the treatment group in 2016. The decline in incomes in 2016 may have been attributable to a sudden decrease in FDI in 2014, a sharp drop in commodity prices in 2015, and risks and uncertainties that affected the mining sector at that time (Doojav and Luvsannyam, 2019). While income is a useful measure of welfare, it is a more volatile and sensitive measure than consumption because accurate income measurement requires survey respondents to understand their assets, returns, profits, and income (Deaton, 1997). Consequently, we focused on consumption, which is considered a better and reliable indicator of welfare at the household level.[17]

[Table 1]

The treatment and control households had similar food consumption levels in 2008 that increased for both groups in 2012 and 2014 but declined in 2016. While non-food expenditures were higher for the treatment group in 2008, its change followed a pattern similar to food consumption. Again, the decline in consumption in 2016 might be due to the economic slowdown caused by the fall in global commodity prices and a decrease in FDI (Li et al., 2017).[18] Medical expenditures followed a similar pattern. On the other hand, education expenditures declined for the treatment households over time but, with some fluctuations, remained constant for the control households.

[17] In constructing the variable consumption, we excluded some of the lumpy non-consumption items, like spending on weddings and religious activities, from the household expenditure. However, throughout the analysis, we used consumption and expenditure interchangeably.

[18] At the same time, the national poverty rate increased to 29.6 percent in 2016 from its lowest level of 21.6 percent in 2014 (NSO, 2019).

The outcome can be a result of Oyu Tolgoi's support for vocational and tertiary education in Southgobi. Energy expenditure, which includes electricity expenditure, increased similarly for both groups over the analysis period.

Before estimating the empirical model, we conduct t-tests to check the significance of the differences in (the natural logarithms of) income and various categories of consumption between the treatment and control households (Table 2). Although incomes were higher for the treatment households in 2008, they were not significantly different from those of their counterparts. The differences were significantly higher for the treatment households in 2012, indicating that they were better off. The difference remained similar in 2014 but slightly decreased in 2016. Expenditures on food, non-food, and medical items demonstrated a similar pattern.

[Table 2]

On the other hand, education expenditure was slightly higher in 2008 for the treatment group than the control group, although the difference was not statistically significant. However, it was lower for the former group for all the periods afterward; the difference was not statistically significant for 2016. Like all other expenditures, energy expenditure was high for the treatment households in 2008, but the difference was not statistically significant. The difference becomes larger and statistically significant for all the subsequent periods. The results indicate that mining activity may positively impact the incomes and some categories of consumption of households in Southgobi that the counterparts in the neighboring provinces do not experience to the same extent.

Our econometric exercise would require controlling for some socio-demographic factors in the model. The advantage of using HSES data for our analysis is that the survey collects information on each household member's age, education, employment, and living conditions (NSO, 2019). Since these characteristics can affect income and consumption at the household level, we controlled these factors in the model. Specifically, our model's independent variables are the household head's age, gender, marital status, and the education of the member who has the highest schooling in the household. We also included the household's urban/rural status and their dwelling type to account for differences in living conditions.

Table 3 presents the summary statistics for the control variables used in the model. Oyu Tolgoi supports local herders, education, health sectors and builds infrastructure in the locality by its CSR spending. In the control period of 2008, CSR spending was low and increased significantly to MNT12.2b in 2012 and MNT15.2b in 2016. Among other variables, the household head's age decreased for the treatment households, while it increased for the control households. The shift in age may happen due to the migration of the younger population into the mining regions, which may offer better job opportunities for them.[19]

[Table 3]

For both groups, over time, male-headed households decreased while household members' educational attainment increased. Interestingly, the proportion of employed household members decreased for both groups. The change in household size and composition over time affects the proportion of working members on average as family size reduces over time in the country. As expected, the proportion of households living in apartments and houses increased for the treatment group in 2016, while it remained the same for the control group. Finally, there is no significant variation in the rural population's proportion for the treatment households while it declined for the control households. Internal migration from rural areas to urban areas, including the capital city, has been on the rise in 2010-2016 due to people's search for better economic opportunities and access to markets and services. Southgobi is the only province with more people settling in than those emigrating (International Organization for Migration, 2018).

4. Results

We carry out our econometric analysis in two steps. First, we regress our dependent variable on the exposure variable (i.e., $ln(CSRspending) \times$ mining) along with year and province fixed effects. In the next step, we add other controls to the specification to get our preferred model. Comparing

[19] Traditionally in Mongolia, following a divorce or the death of a husband, the oldest son becomes household head. The number of divorces in Southgobi during 2008-2016 increased by 285 percent, compared to 110 percent for the entire country (NSO, 2019). The relatively higher divorce rates in Southgobi may partly explain the younger age of households as the proportion of married couples decreased for both the control and treatment groups.

both model results would indicate whether any control modifies the impact significantly, which consequently would show whether the estimates of β remain stable with additional controls. All the models in this analysis were estimated using sample weights, with standard errors clustered at the primary sampling unit level. Following the convention, all tests were conducted at the five percent significance level. Results that are not presented here are available from the author upon request.

4.1. Main results

Table 4 reports the effects of mining on income, food consumption, and non-food expenditure per capita. The DD estimate is positive and significant in column 1, suggesting that mining activity increased real incomes. As expected, the year fixed effects show the significant growth in the control households' incomes during the period 2012-2016. The results remain stable when we include other control variables in the model. The DD coefficient estimate in column 2 from our preferred estimate indicates that a 10 percent increase in CSR spending increases households' real incomes by 2.2 percent in Southgobi.

[Table 4]

The coefficients of the control variables in column 2 are mostly meaningful and statistically significant. For example, in line with previous studies like Bertrand et al. (2004); Juhn and McCue (2017), our results indicate that both older and male-headed households earn significantly more than their counterparts.[20] Among other significant variables, married household heads generally earned significantly less than households with unmarried or separated heads. This finding can be due to women's responsibility to raise children, limiting their potential to earn additional income. For example, when married couples have their first child, women's working hours decline by 45 percent on average, and the pay rate is reduced by five percent, while there is no adverse effect on the husband's working hours and nine percent increase in pay rate (Lundberg and Rose, 2000). The

[20] Women in Mongolia earned 24 percent less income than their male counterparts in 2012 (Bekhouche et al., 2013). Female wages are lower in oil and mineral-rich countries because traded sectors, which mostly employ female workers, shrink due to an appreciation of the currency and the expansion of non-traded sectors (Ross, 2008).

incomes of those living in an apartment or a house with water, sewage, and heating infrastructure are 58 percent higher than those living in traditional Mongolian gers.[21] This result confirms the *a-priori* expectation that income is associated with living standards.[22] Overall, the model explains a significant proportion (44 percent) of the variations in income.

The increase in income is attributable to the development of the mine and the mining company's initiatives to support the local economy. For example, Oyu Tolgoi's CSR activities target expanding local market-based, non-mining businesses, improving the livelihoods of local herders and residents, preserving cultural heritage, and investing in the health and education sectors in Southgobi (Oyu Tolgoi, 2018). The local community may realize the benefits of mining through higher employment opportunities and CSR activities. Mines similar to Oyu Tolgoi, such as Yanacocha gold mine in Peru (Aragón and Rud, 2013) and Debswana – a diamond mining company in Botswana (Wilson, 2007) have had positive effects on local community welfare. Our findings are also consistent with those in developed countries – Fleming and Measham (2015) on Australia and Allcott and Keniston (2017); Michaels (2011) on the US – all finding mining activity to have a positive impact on local incomes and welfare.

Columns 3 and 4 of Table 4 present the estimates from our model with food consumption. Columns 3 results show that treatment households, compared to their control counterparts, increased their food consumption considerably. Food consumption for the control households also increased over time. Column 4 presents the results from the preferred model that includes other controls in the specification. The DD estimate indicates that a 10 percent increase in CSR spending resulted in a rise of 2.3 percent in food consumption. All other control variables have a coefficient that is similar to that in Column 2. The model explains 44 percent of the variations in food consumption.

Results for non-food consumption, presented in Columns 5 and 6 of Table 4, are mainly similar to that of income and food expenditure. Estimates from our preferred model in Column 6 indicate

[21] A ger is a traditional Mongolian house that is built by assembling a wooden framework and covering it with traditional felt. It is the most portable and suitable dwelling for nomads. However, people still live in gers in both rural and urban areas in Mongolia. In 2016, 40 percent of the total Mongolian population used to live in gers, 36 percent in detached houses, and 24 percent in apartments (NSO, 2017).

[22] Income can be endogenous in such models as higher incomes may lead to higher living standards. Dropping living conditions from the model does not affect our conclusions qualitatively.

that a 10 percent increase in CSR would increase non-food consumption by 1.9 percent. The direction and significance of other control variables are similar to those in columns 2 and 4. The model explains 43 percent of the variations in non-food consumption.

Interestingly, our elasticity estimate for non-food expenditure is lower than food consumption. While non-food expenditure elasticity is usually higher than that for food, the opposite may occur for low-income countries where the budget share for food may increase as income rises (Almås, 2012). In particular, Hasan (2016) found that households in Bangladesh, a low-income country, initially increased their budget share for food when their incomes rose. Bhalotra and Attfield (1998) also found that low-income households in rural Pakistan spent nearly all of their additional income on food, resulting in a higher elasticity for food expenditure than the non-food one. Household food consumption is low in Mongolia as budget constraints restrict their access to various food products. The finding is evident from the fact that including income in food and non-food consumption models drastically reduces the DD estimates' size in both cases, although they remain statistically significant. Thus, our results are consistent with others in a developing country setting.

Table 5 reports the results of our investigation with expenditure on three critical categories – medical, education, and energy. Columns 1 and 2 of the table show that the effect on medical expenditures is positive and significant, indicating that households in Southgobi increased their medical expenses disproportionately than those in the neighboring provinces due to the mining activity. Our preferred model in Column 2 suggests that a 10 percent increase in CSR spending increases medical expenditures by 1.45 percent. This positive outcome could result from the increased employment opportunity and income-generating activities in Southgobi, which allowed households in that province to spend more on their health.

[Table 5]

Our estimate may underestimate the real impact of the mining activity on welfare. The reason is Oyu Tolgoi's community health program aimed to reduce the threats of infectious diseases, create safe environments for local people, and strengthen the capacity of local health care workers. In 2006, Oyu Tolgoi built apartments for doctors in isolated towns to support the health sector in local areas and trained health care workers on first aid and other medical services. The company

also funded hepatitis screening and vaccination for health workers in 2012 and supplied ambulances and equipment to some town hospitals in 2013 (Oyu Tolgoi, 2018). All these allowed people in Southgobi to save money on some activities, thus lowering their health expenditures. Furthermore, the initiatives strengthened the capacity, quality, and accessibility of health services in Southgobi, allowing people to spend more on health by removing the supply constraint on medical services.[23]

However, increased health care expenditure may mean that local people living nearby the mine experience frequent or severe illnesses than their counterparts. Studies on other countries sometimes reported such an outcome. For example, incidence of anemia among women and stunting in children was higher for those who live in the proximity of mines that release lead contamination than those who lived far (von der Goltz and Barnwal, 2019). We employ the linear probability model, probit, and logit models to examine the effect of mining on the individuals' likelihood of feeling unwell. The results indicate that, during the same period, sickness did not increase significantly in Southgobi (see Table A.2). Since there is no evidence that mining is causing adverse health impacts on local communities in Southgobi in Mongolia, we associate the positive health expenditure elasticity with higher income and access to health care services created by the mining industry.

The population health statistics show that the general health of the population of Umnugovi is not worse than the other provinces. For example, the monthly under-five mortality rate per 1,000 live births in Southgobi is below the national median. The under-five mortality in Southgobi dropped from 22.75 in 2009 to 16 in 2016, while other provinces made slower progress. Although the new cases of cancer reported per 10,000 population rose between 4-9% on average annually across the provinces in the study, the growth in mortality rate from cancer per 10,000 population remains similar across three provinces Umnugovi, Dundgovi and Uvurkhangai (NSO, 2019).

Next, we focus on the effects of mining activity on education expenditures. Estimated results are presented in columns 3 and 4 of Table 5. The DD estimate in our preferred specification (Column 4) is negative and significant, indicating that a 10 percent rise in mining activity leads to a decline of 0.7 percent in household education expenditures. The CSR activities in the mining

[23]Note that such programs proved to be useful for health promotion. For example, infant mortality declined in African localities. Large-scale gold-mining spurred local economic growth and improved access to health care information, contributing to the effective treatment of child diarrhea (Tolonen, 2018).

region, similar to health services, supported educational services that might reduce households' spending on education. Recently, 292 students from Southgobi province received scholarships from Oyu Tolgoi to study medical science, education, agriculture, construction engineering, and environmental management (Oyu Tolgoi, 2018).

Additionally, 184 health care workers were trained on medical waste management and first aid equipment from 2010, while 26 doctors in 13 towns received scholarships to attend training in 2013. The "Gobi Oyu" DSF built two kindergartens, which accommodated 400 children in 2016 (Oyu Tolgoi, 2018). Thus the lower educational spending in Southgobi could be due to the better job prospective of potential students created by the mining activity.

On the other hand, low expenditure on education can engender from the lower educational attainment in Southgobi due to higher employment opportunity in the region, as was seen in some earlier studies (e.g., Douglas and Walker, 2017; Ahlerup et al., 2020). We employ the OLS and Ordered logit model to explain the household heads' educational attainment years to examine the issue. The results indicate that, during the same period, the increase in educational attainment in Southgobi was significantly higher than the same in other provinces of the country (see Table A.3). Thus, we can reject the low-enrollment issue and conclude that mining activity positively impacted educational outcomes for Southgobi residents while allowing them to spend less than their counterparts due to their increased access to free educational activities.[24]

Next, we analyze energy expenditures that include electricity and other types of energy in columns 5 and 6 of Table 5. Households in Southgobi increased their energy expenditures more compared to the control households. Energy expenditures in our preferred specification rise by 1.2 percent due to a 10 percent increase in mining activity (Column 6). The higher energy expenditures may result from the increased electricity availability in the mining region, raising household consumption of and expenses on power. For example, Oyu Tolgoi connected two Southgobi towns with intermittent electricity supply to the central electric grid (Oyu Tolgoi, 2018). Also, the avail-

[24] A plausible explanation for household heads' higher educational attainment is the internal migration of more educated households into Southgobi province following the mining development. However, the number of full-time students enrolled in the general education schools remained at 10.5 thousand during 2009-2011, and declined slightly to 10.4 thousand in 2012-2013 and then increased to 11.4 thousand in 2016. On the other hand, the number of students in the three other neighboring provinces was in decline, while it increased slightly in one of the control provinces in the same period (NSO, 2019).

ability of energy through price subsidy can lead to such an outcome, as indicated by the fact that including income in the model generates a negative and significant DD estimate. [25]

We also investigate the effect of mining on the expenditures on clothing, services, and transportation (Table 6). The DD estimates for apparel and services are positive and significant, while the estimates are not statistically significant for transportation. Our results in Column 2 indicate that a 10 percent increase in CSR spending led to a rise of 1.1 percent in clothing expenditure. Compared to households in the neighboring provinces, those living in Southgobi might increase their clothing expenditures due to their increased incomes. Since we do not include income in the model, and CSR spending has a positive correlation with income, the DD coefficient captures the effect of income on clothing expenditure. When we include income in the model, the DD coefficient becomes small and statistically insignificant, confirming the correlation between CSR spending and income.

[Table 6]

On the other hand, a 10 percent increase in the CSR activities raises the expenditures on services of Southgobi households by 1.7 percent, compared to the control households (Column 4). People likely spend more on services as incomes rise and services become more available, resulting from the local economy's overall development boosted by the mining sector. The DD coefficient remains large and statistically significant even when we include income in the model, confirming the effect of increased incomes.

Expenditures on transportation exhibit a positive association with CSR spending, although the effect is not statistically significant at the conventional level of significance (Column 6). Such results are in line with our expectations for two reasons. First, road infrastructure resulting from mines' operations can reduce the costs of commuting and accessing markets for automobiles, leading to higher spending on transportation. Second, households facing more local consumption opportunities may increase their transportation costs than those living in less advantaged locations because

[25] Oyu Tolgoi provided diesel fuel for power plants in four sub-provinces in Southgobi, making electricity available and affordable for households (Oyu TOlgoi, 2010).

more goods and services are locally available due to the mining boosted local economy (Papageorgiou and Thisse, 1985). The outcome is confirmed because the DD coefficient becomes negative and statistically significant even when we include income in the model.

Overall, the results reported in Tables 4-6 provide evidence that the large-scale mine in Southgobi had a significant positive impact on the incomes and welfare of local households.

4.2. Robustness checks

We perform additional checks to see whether our measures of welfare are robust. First, we look at two other variables that can also capture the impact of mining activity on household income and consumption – local taxes paid by the mining company to the local government and wages paid to employees. Thus, in modeling income and consumption, we used the mining company's wages paid to the employees as a proxy to mining activities and repeat Tables 4-6. The results indicate that mining wages also have a positive and significant impact on the welfare of households in the mining region (Tables A.4-A.6). Although the magnitudes of coefficients are smaller as they do not capture CSR activities' impact, they are qualitatively similar to our main results. Our investigation with local taxes as a proxy to mining activities also indicate that mining activities have a positive and significant effect on household welfare (Tables A.7-A.9).

The increases in incomes resulting from mining activities drive the significant changes that we observe in consumption. We focus on the different categories of consumption to better understand the local welfare outcomes of mining activities. As household income and consumption are highly correlated, adding income as a control variable in the DD model will capture part of the effects of CSR spending. Thus, we examine how income affects the DD model outcomes for each category of consumption. In line with our expectations, income significantly affects food and non-food consumption and expenditures on health, energy, clothing, services, and transportation. However, it has a significant and negative effect on education expenditures, reflecting the fact that higher income is associated with mining activity. The DD estimates are mostly significant even when we include income in the model, indicating that mining activities may positively affect welfare beyond the conventional income channel, e.g., through the CSR activities.

Our results are robust to the inclusion of CSR spending by another mining company, Mongolian Mining Corporation, that actively supports community development in Southgobi. The Mongolian Mining Corporation mainly builds infrastructure development, implements community development programs, provides grants and sponsorships, and undertakes local procurement in sub-province, Tsogt-Tsetsii. On the other hand, Oyu Tolgoi's CSR activities' outreach is beyond the sub-province where it operates. The results are available from the author upon request.

We also examine whether the choice of variables in per capita terms affects our results. We explore this because there are economies of scale in household consumption, while demographic factors may also affect consumption level. Income and consumption analyses widely utilize equivalence scales to address those issues (Bishop et al., 2014). We use two well-known equivalence scales – the square root of family size (SRFS) and modified OECD equivalence scale (Aaberge and Melby, 1998; Schwarze, 2003). The former takes the square root of the number of family members to adjust the household size. The latter assigns one to the first adult and adds 0.5 for an additional adult and 0.3 for an extra child in the household. The models using the equivalized variables, the SFRS and modified OECD scale, produce qualitatively similar results as our results, indicating the robustness of our main findings.

4.3. Validity of the common trend assumption

The validity of our difference-in-differences model depends on the parallel trend assumption, as we discussed previously. We examine the common trend assumption visually. Figure 5 plots the monthly real per capita incomes and food, and non-food consumption, separately for the households located in Southgobi province and those living in the neighboring areas. Panel (a) in the figure shows that until 2012 real incomes for both the groups follow a similar trend. However, they diverge after 2012, with the income increasing substantially for households living in Southgobi. The same pattern holds for food consumption in Panel (b). The pattern is less clear for the non-food consumption in Panel (c). We, therefore, undertake an econometrics analysis to examine the validity of the common trend assumption.

[Figure 5]

We conduct a placebo test using a conventional DD model with the interaction of dummy variables as it is not plausible to conduct a placebo test with equation (2). Since we would not expect to see significant differences in the incomes and consumption of treatment and control households before the large-scale mine commenced operations, using the year 2002 as the event year would serve as a useful "placebo test". In that model, we also include households from the 2002 round of HSES survey, the only available survey that collected household-level information before 2008.[26] We expect that the interactions between the years and the treatment dummy D would be positive and significant, except for 2002, as there was no large-scale mining activity before 2008.

Table 7 presents the results of the Placebo test. The estimate of the dummy variable 'Southgobi' in column 1 shows that the per capita incomes of households in Southgobi were higher in 2008, although the difference was not statistically significant. The real incomes of the control group increased over time, as indicated by the year fixed effects. The difference in incomes between the control and treatment group was not significantly different in 2002, as shown by the interaction of Southgobi and 2002. As expected, the effects were positive and significant for 2012, 2014, and 2016. We expect such a finding as mining activity, including CSR spending, peaked in 2012-2013 and continued to rise in subsequent years. The control variables' size and significance in column 2 remain similar to what we observed in our previous models. The same pattern holds for both food, and non-food consumption reported in columns 4 and 6, respectively. Thus, the overall placebo test results validate the identifying assumption of the DD model.

[Table 7]

4.4. Policy implications

Overall, we observe the local benefits of mining activities. Such activity directly increased household incomes, allowing people to increase spending on food and non-food items. Mining also enabled increased access to health and education services. Increased spending on food and medical services will benefit the population in the long-run as a higher level of nutrition, and better access

[26] Specifically, we run the following model: $y_{ist} = \delta + \eta_t + \alpha_s + \sum_t \beta_t(\eta_t \times D) + X_{ist}\Theta + \varepsilon_i$, where, in addition to the previous notations, D is a dummy taking the value of 1 if a household is from Southgobi, and 0 otherwise.

to health services enable people to live longer, healthier, and have a more productive life. Improved education services will improve this outcome further. Households spend less on education due to the CSR spending on learning activities, but, as they enjoy free educational activities, educational attainments were higher. Thus, in addition to income, CSR spending played a vital role in realizing improved welfare for Southgobi households.

Thus, local cooperation agreements between local administrative bodies and mining companies can benefit communities that can otherwise be affected negatively by large-scale resource extraction. Policies that support local employment, purchases, and CSR spending enhance opportunities and livelihoods for the local population. Therefore, resource-rich developing countries should design the laws and regulations that enforce large-scale mines to contribute equitably to local socio-economic development. It is also essential that governments and local administrative bodies have clear guidelines and rules for establishing the local-level cooperation agreements for mining companies. A clear set of guidelines will enhance residents' voices in negotiation with mining companies and strengthen the cooperation agreements' accountability and transparency.

Our study also highlights the importance of looking beyond income draws a better picture of mining activity's impact on household welfare. The reason is that income may not capture some welfare-enhancing amenities created by CSR activities or spending by the local government.

It is important to note two potential issues with our study. First, we investigated the impacts of a large-scale and foreign-invested mine, such as Oyu Tolgoi, which may have better outreach to local communities than mines smaller in size with limited financial capabilities. The majority of mining companies in Mongolia still have not established cooperation agreements with local administrative bodies as required by the minerals law due to the government's lack of clear guidance and weak law enforcement. Thus our findings may not directly apply to locally owned small mines as they may not have the urge and capacity to invest in CSR activities. Second, this study only focused on the short-run gains from mining as we only examined the effects occurring in the early development and operational periods of mining. Although we can infer that the short-run improvement in health, education, and nutrition will provide long-run benefits, future research should examine the *ex-post* gains, focusing on the intermediate/outcome welfare indicators.

5. Conclusion

We investigate the impact of a large-scale, capital-intensive mine on households' incomes and consumption in a mining region. Using a VAR model and the sub-national level data, we find that the mining sector positively impacted the local economy. We then use difference-in-differences models with several rounds of recent household survey data from Mongolia and find robust evidence that large-scale mining activity benefited the local population. Compared to the households in the neighboring provinces, the incomes, food, and non-food consumption of households in the mining province increased disproportionately. The CSR activities undertaken by the large-scale mining company eased the supply constraints of the health care services, which enabled households to purchase medical services and increase their medical expenditures. Besides, support for secondary and tertiary education, facilitated by the mining company, enhanced educational outcomes while the expenditure on those groups reduced significantly for the households in the mining region. The paper's main contribution is to show that large-scale extractive industries can generate positive welfare outcomes for residents, and CSR activities further enhance the mining sector's traditional benefits. While analyzing the impact of mining activity on household welfare, we also demonstrate that consumption can draw a better picture than income because the latter may not effectively capture welfare enhancements resulting from CSR activities or spending by the local government.

Our investigation extends the understanding of resource extraction's local impacts in developing countries in the presence of policies, laws, and regulations that promote responsible mining, including the implementation of corporate social responsibility activities. We emphasize the importance of the right policy settings and not-for-profit initiatives of mining companies to benefit the local communities who can otherwise be affected negatively by large-scale resource extraction.

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6. Figures

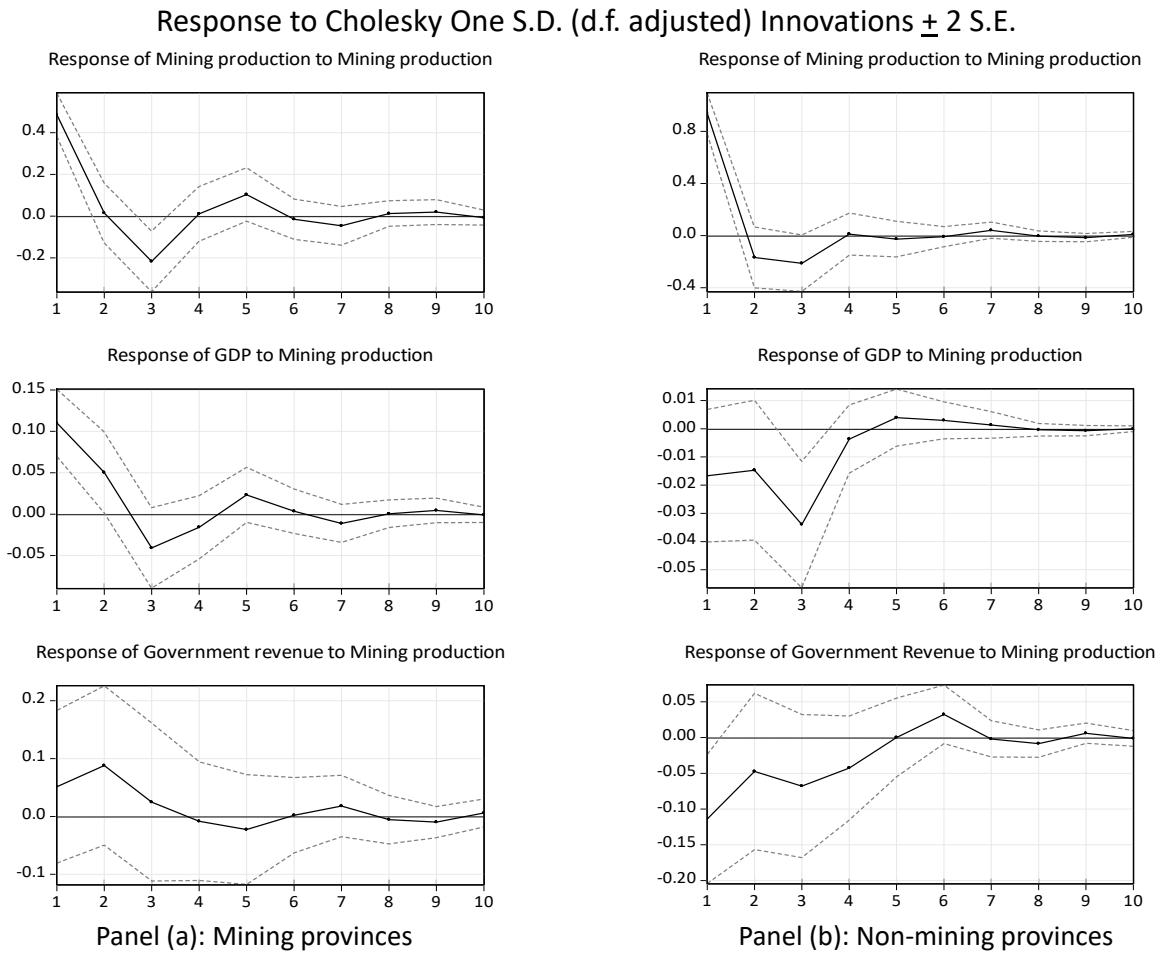
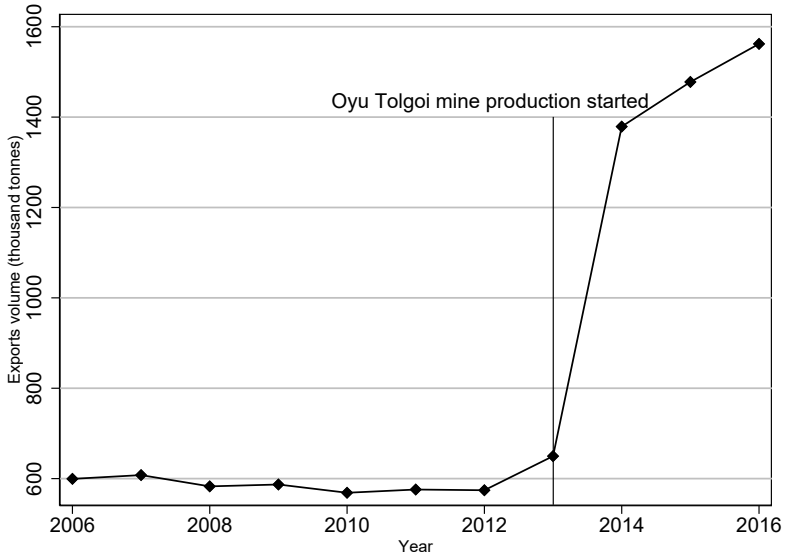


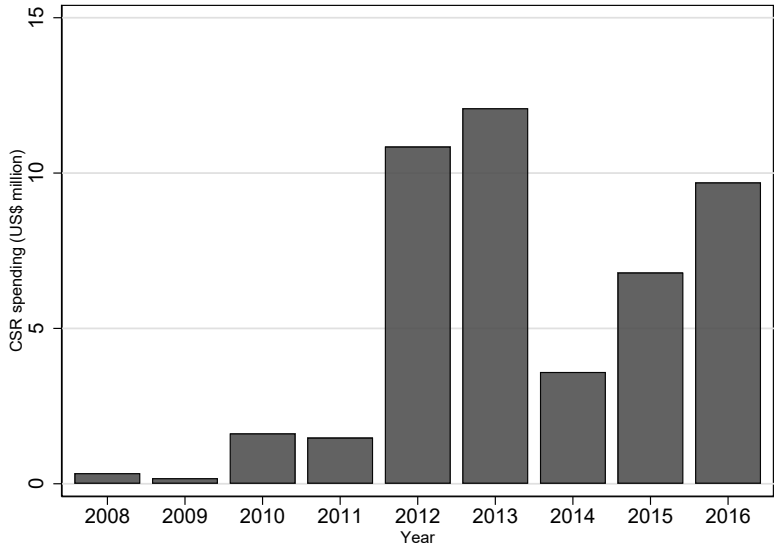
FIGURE 1: IMPULSE RESPONSE FUNCTIONS FOR PROVINCES



Source: NSO, 2019

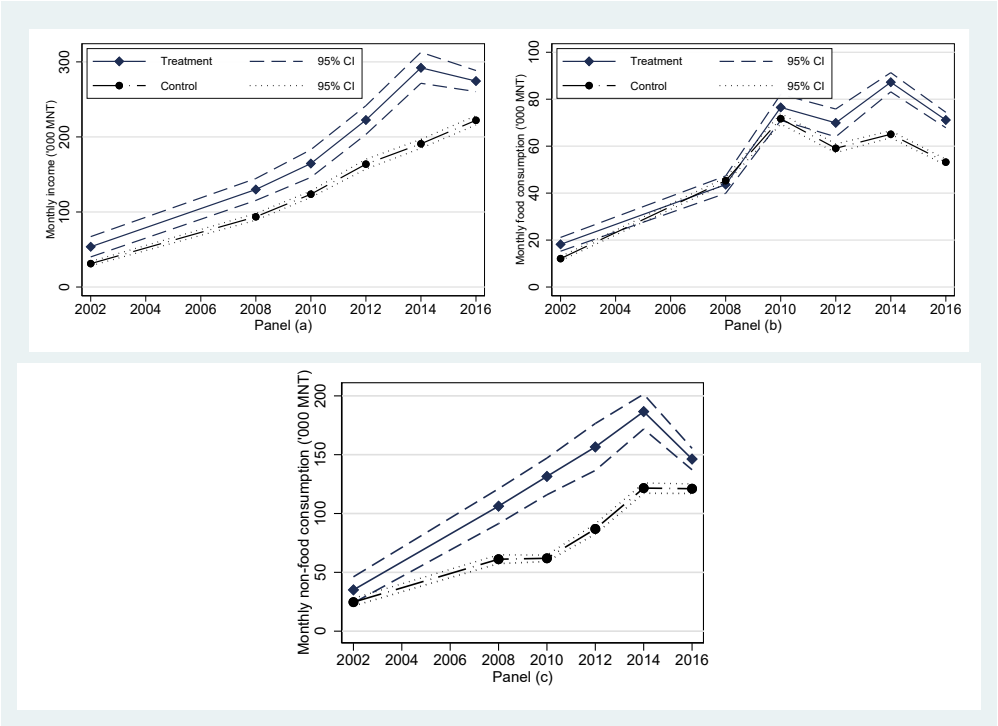
FIGURE 2: EXPORTS VOLUME OF COPPER CONCENTRATE, 2006-2016

FIGURE 3: MAP OF MONGOLIA



Source: OT, 2008-2016

FIGURE 4: CSR SPENDING, 2008-2016, ANNUAL



Source: NSO, 2002-2016

FIGURE 5: MONTHLY INCOME, FOOD AND NON-FOOD CONSUMPTION, 2002-2016

7. Tables

TABLE 1: **Summary statistics of dependent variables**

	2008		2012		2014		2016	
Variable	Treatment	Control	Treatment	Control	Treatment	Control	Treatment	Control
Per capita income	130	94	223	164	292	191	274	222
	(129)	(91)	(172)	(143)	(262)	(150)	(179)	(159)
Per capita food consumption	44	45	70	59	87	65	71	53
	(33)	(27)	(53)	(41)	(52)	(38)	(42)	(33)
Per capita non-food consumption	106	61	157	87	187	122	146	121
	(131)	(76)	(179)	(95)	(188)	(112)	(116)	(105)
Per capita medical expenditures	2	1	3	3	11	3	6	5
	(3)	(4)	(7)	(7)	(101)	(8)	(14)	(16)
Per capita education expenditures	7	6	6	5	4	6	4	6
	(16)	(12)	(15)	(12)	(13)	(13)	(11)	(17)
Per capita energy expenditures	3	4	5	6	7	7	9	9
	(3)	(5)	(5)	(6)	(6)	(7)	(6)	(7)
Per capita clothing expenditures	14	10	26	18	30	23	24	21
	(13)	(8)	(23)	(13)	(24)	(17)	(20)	(17)
Per capita services expenditures	3	1	3	1	3	1	3	2
	(5)	(2)	(7)	(2)	(13)	(2)	(4)	(5)
Per capita transportation expenditures	18	10	25	11	25	14	22	15
	(37)	(19)	(29)	(14)	(33)	(20)	(26)	(22)
Number of households	304	1,597	312	1,819	622	2,493	624	2,582

Note: Means are reported in thousand Tugrik (MNT): The exchange rate for the end of survey period (December) ranged from US$1 ≈ 1229 MNT in 2008 to US$1≈ 2483 MNT in 2016. All values are on per capita monthly basis and adjusted for inflation. Standard deviations are reported in the parentheses.

TABLE 2: **Difference between treatment and control households**

Variable name	2008	2012	2014	2016
ln(Per capita income)	0.166	0.991***	0.974***	0.823***
	(0.153)	(0.181)	(0.146)	(0.157)
ln(Per capita food consumption)	0.034	0.847***	0.860***	0.781***
	(0.145)	(0.171)	(0.136)	(0.140)
ln(Per capita non-food consumption)	0.251*	1.047***	0.927***	0.773***
	(0.141)	(0.169)	(0.138)	(0.146)
ln(Per capita medical expenditures)	0.092	0.592***	0.624***	0.535***
	(0.095)	(0.116)	(0.098)	(0.107)
ln(Per capita education expenditures)	0.055	-0.198**	-0.161***	-0.031
	(0.077)	(0.080)	(0.057)	(0.062)
ln(Per capita energy expenditures)	0.127	0.475***	0.541***	0.560***
	(0.109)	(0.137)	(0.111)	(0.119)
ln(Per capita clothing expenditures)	0.170	0.753***	0.717***	0.594***
	(0.114)	(0.139)	(0.113)	(0.119)
ln(Per capita services expenditures)	0.491***	0.989***	0.212**	0.965***
	(0.084)	(0.100)	(0.086)	(0.099)
ln(Per capita transportation expenditures)	0.624***	0.715***	0.731***	0.867***
	(0.119)	(0.137)	(0.108)	(0.116)
Number of households	1,901	2,131	3,115	3,206

Note: Mean of differences between households in treatment and control regions are reported for each year. Standards errors are recorded in the parentheses. * p <0.10, ** p <0.05, *** p <0.01.

TABLE 3: **Summary statistics of control variables**

	2008		2012		2014		2016	
Variable	Treatment	Control	Treatment	Control	Treatment	Control	Treatment	Control
CSR spending	495.51	0.00	12,199.07	0.00	4,393.61	0.00	15,159.27	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Household head's age	46.50	44.51	46.30	44.98	44.78	45.80	43.35	46.26
	(15.06)	(14.39)	(15.57)	(14.51)	(15.00)	(14.26)	(14.63)	(15.05)
Household head is married	0.63	0.69	0.47	0.67	0.51	0.63	0.47	0.59
	(0.48)	(0.46)	(0.50)	(0.47)	(0.50)	(0.48)	(0.50)	(0.49)
Household head is male	0.74	0.82	0.71	0.80	0.73	0.77	0.71	0.75
	(0.44)	(0.39)	(0.45)	(0.40)	(0.44)	(0.42)	(0.45)	(0.43)
Years of education	11.11	10.86	11.66	11.80	12.14	12.30	12.43	11.76
	(3.61)	(3.76)	(4.24)	(4.22)	(4.61)	(4.41)	(3.53)	(3.91)
Proportion of working members	0.63	0.49	0.44	0.42	0.39	0.40	0.42	0.36
	(0.28)	(0.28)	(0.33)	(0.29)	(0.32)	(0.30)	(0.33)	(0.31)
Lives in apartment/house	0.07	0.11	0.08	0.07	0.06	0.10	0.10	0.11
	(0.26)	(0.31)	(0.27)	(0.26)	(0.24)	(0.29)	(0.30)	(0.32)
Lives in rural area	0.61	0.70	0.62	0.74	0.61	0.61	0.62	0.63
	(0.49)	(0.46)	(0.49)	(0.44)	(0.49)	(0.49)	(0.49)	(0.48)
Number of households	304	1,597	312	1,819	622	2,493	624	2,582

Note: CSR spending is in million MNT. Education is the highest number of years for any member of the household. Dummy variables indicating rural/urban status and living conditions show their sample proportions. Standard deviations are reported in the parentheses.

TABLE 4: **Effect of mining on income, food and non-food consumption**

	ln(income)		ln(food)		ln(non-food)	
Variable	(1)	(2)	(3)	(4)	(5)	(6)
ln(CSR spending) × mining	0.194***	0.218***	0.208***	0.227***	0.166***	0.187***
	(0.067)	(0.056)	(0.062)	(0.050)	(0.063)	(0.053)
Year=2012	0.775***	0.843***	0.619***	0.687***	0.728***	0.792***
	(0.101)	(0.085)	(0.097)	(0.080)	(0.093)	(0.081)
Year=2014	0.932***	1.086***	0.750***	0.903***	0.913***	1.057***
	(0.096)	(0.076)	(0.091)	(0.072)	(0.089)	(0.072)
Year=2016	1.309***	1.303***	0.938***	0.940***	1.211***	1.203***
	(0.099)	(0.086)	(0.092)	(0.080)	(0.091)	(0.081)
Household head's age		0.045***		0.040***		0.040***
		(0.002)		(0.002)		(0.002)
Household head is married		-3.343***		-3.128***		-3.115***
		(0.107)		(0.099)		(0.099)
Household head is male		0.744***		0.720***		0.662***
		(0.125)		(0.116)		(0.116)
Proportion of working members		2.056***		1.837***		1.965***
		(0.119)		(0.109)		(0.113)
Lives in apartment/house		0.452***		0.335***		0.438***
		(0.094)		(0.084)		(0.090)
Lives in rural area		-0.290***		-0.228***		-0.314***
		(0.061)		(0.057)		(0.058)
Province fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.03	0.44	0.03	0.44	0.04	0.43
Number of households	10,353	10,353	10,353	10,353	10,353	10,353

Note: 1. All dependent variables are on monthly per capita basis and in real terms.
2. Education is controlled in the model but not reported.
3. Including age^2 does not affect the results.
4. Clustered standard errors are reported in the parentheses.
* p <0.10, ** p <0.05, *** p <0.01.

TABLE 5: **Effect of mining on medical, education and energy expenditures**

	ln(medical)		ln(education)		ln(energy)	
Variable	(1)	(2)	(3)	(4)	(5)	(6)
ln(CSR spending) × mining	0.124***	0.145***	-0.037	-0.076***	0.109**	0.118***
	(0.045)	(0.039)	(0.029)	(0.024)	(0.047)	(0.042)
Year=2012	0.553***	0.561***	0.053	0.016	0.687***	0.692***
	(0.064)	(0.059)	(0.048)	(0.041)	(0.083)	(0.077)
Year=2014	0.766***	0.815***	-0.057	-0.126***	0.905***	0.965***
	(0.063)	(0.055)	(0.043)	(0.040)	(0.074)	(0.065)
Year=2016	1.087***	1.029***	-0.079*	-0.136***	1.266***	1.182***
	(0.063)	(0.059)	(0.045)	(0.042)	(0.078)	(0.073)
Household head's age		0.039***		-0.033***		0.034***
		(0.001)		(0.001)		(0.002)
Household head is married		-1.953***		0.549***		-2.451***
		(0.066)		(0.039)		(0.084)
Household head is male		0.321***		-0.679***		0.438***
		(0.079)		(0.049)		(0.099)
Proportion of working members		0.953***		-0.722***		1.124***
		(0.079)		(0.049)		(0.092)
Lives in apartment/house		0.331***		0.008		0.133*
		(0.063)		(0.052)		(0.071)
Lives in rural area		-0.247***		-0.012		-0.415***
		(0.042)		(0.030)		(0.052)
Province fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.05	0.43	0.00	0.23	0.04	0.41
Number of households	10,353	10,353	10,353	10,353	10,353	10,353

Note: 1. All dependent variables are on monthly per capita basis and in real terms.
2. Education is controlled in the model but not reported.
3. Including age^2 does not affect the results.
4. Standards errors, clustered at the 744 primary sampling units, are recorded in the parentheses.
* p <0.10, ** p <0.05, *** p <0.01.

TABLE 6: **Effect of mining on other expenditures**

	ln(clothing)		ln(services)		ln(transportation)	
Variable	(1)	(2)	(3)	(4)	(5)	(6)
ln(CSR spending) × mining	0.132***	0.150***	0.157***	0.171***	0.043	0.059
	(0.051)	(0.043)	(0.047)	(0.045)	(0.055)	(0.050)
Year=2012	0.655***	0.723***	-0.507***	-0.464***	0.874***	0.945***
	(0.075)	(0.068)	(0.077)	(0.078)	(0.084)	(0.083)
Year=2014	0.779***	0.919***	0.490***	0.569***	1.021***	1.161***
	(0.073)	(0.061)	(0.069)	(0.067)	(0.080)	(0.076)
Year=2016	0.986***	1.008***	0.736***	0.772***	1.294***	1.343***
	(0.073)	(0.067)	(0.079)	(0.074)	(0.086)	(0.085)
Household head's age		0.028***		0.005***		0.017***
		(0.002)		(0.002)		(0.002)
Household head is married		-2.505***		-0.921***		-2.111***
		(0.082)		(0.071)		(0.086)
Household head is male		0.500***		0.103		0.582***
		(0.095)		(0.078)		(0.101)
Proportion of working members		1.842***		1.301***		1.943***
		(0.096)		(0.099)		(0.111)
Lives in apartment/house		0.375***		0.312***		0.347***
		(0.072)		(0.089)		(0.082)
Lives in rural area		-0.240***		-0.328***		-0.316***
		(0.050)		(0.060)		(0.051)
Province fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.04	0.40	0.09	0.18	0.06	0.28
Number of households	10,353	10,353	10,353	10,353	10,353	10,353

Note: 1. All dependent variables are on monthly per capita basis and in real terms.
2. Education is controlled in the model but not reported.
3. Including age^2 does not affect the results.
4. Standards errors, clustered at the 744 primary sampling units, are recorded in the parentheses.
* p <0.10, ** p <0.05, *** p <0.01.

TABLE 7: **Placebo test on income, food and non-food consumption**

	ln(income)		ln(food)		ln(non-food)	
Variable	(1)	(2)	(3)	(4)	(5)	(6)
Southgobi	0.146	-0.362**	0.001	-0.466***	0.231	-0.240
	(0.185)	(0.151)	(0.171)	(0.137)	(0.172)	(0.146)
2002	-0.378***	-0.084	-0.485***	-0.151	-0.397***	-0.168
	(0.134)	(0.148)	(0.122)	(0.139)	(0.126)	(0.139)
2012	0.713***	0.895***	0.573***	0.743***	0.636***	0.808***
	(0.098)	(0.080)	(0.093)	(0.075)	(0.089)	(0.076)
2014	0.934***	1.014***	0.750***	0.837***	0.922***	0.996***
	(0.095)	(0.078)	(0.090)	(0.074)	(0.088)	(0.074)
2016	1.346***	1.302***	0.969***	0.935***	1.250***	1.209***
	(0.098)	(0.084)	(0.090)	(0.078)	(0.090)	(0.079)
Southgobi × 2002	0.566	0.459	0.658	0.542	0.480	0.396
	(0.434)	(0.361)	(0.417)	(0.347)	(0.408)	(0.339)
Southgobi × 2012	0.839***	0.524**	0.822***	0.519***	0.808***	0.523**
	(0.279)	(0.221)	(0.261)	(0.199)	(0.263)	(0.209)
Southgobi × 2014	0.822***	0.978***	0.839***	0.958***	0.689***	0.845***
	(0.251)	(0.197)	(0.234)	(0.181)	(0.236)	(0.190)
Southgobi × 2016	0.668***	0.914***	0.757***	0.966***	0.532**	0.758***
	(0.242)	(0.202)	(0.221)	(0.182)	(0.227)	(0.193)
Household head's age		0.046***		0.040***		0.041***
		(0.002)		(0.002)		(0.002)
Household head is married		-3.290***		-3.068***		-3.057***
		(0.098)		(0.091)		(0.091)
Household head is male		0.700***		0.672***		0.611***
		(0.113)		(0.105)		(0.106)
Proportion of working members		2.053***		1.822***		1.968***
		(0.106)		(0.097)		(0.101)
Lives in apartment/house		0.407***		0.308***		0.391***
		(0.079)		(0.071)		(0.075)
Lives in rural area		-0.281***		-0.218***		-0.296***
		(0.056)		(0.051)		(0.053)
Province fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.04	0.43	0.03	0.43	0.04	0.42
Number of households	10,931	10,931	10,931	10,931	10,931	10,931

Note: 1. All dependent variables are on monthly per capita basis and in real terms.
2. Education is controlled in the model but not reported.
3. Including age^2 does not affect the results.
4. Standards errors, clustered at the 744 primary sampling units, are recorded in the parentheses.
* p <0.10, ** p <0.05, *** p <0.01.

Appendix A: Additional Tables

TABLE A.1: **Categorization of mining and non-mining provinces in Mongolia**

Province	Mining production	Govt revenue	GDP	% of Mining in GDP	Mining
Arkhangai	13.40	489.25	3,513.74	0.31	Non-mining
Bayankhongor	316.01	542.09	3,451.97	7.50	Non-mining
Bayan-Ulgii	59.13	491.55	2,666.06	2.07	Non-mining
Bulgan	56.06	632.71	4,232.63	1.23	Non-mining
Darkhan-Uul	354.25	395.50	3,291.44	10.57	Mining
Dornod	3,741.44	509.94	6,674.69	51.42	Mining
Dornogovi	515.53	578.41	4,019.90	13.49	Mining
Dundgovi	34.04	653.75	4,448.71	0.73	Non-mining
Govi-Altai	242.63	680.51	3,458.76	5.40	Non-mining
Govisumber	1,039.53	715.17	4,062.97	25.98	Mining
Khentii	18.95	560.50	3,942.83	0.51	Non-mining
Khovd	84.66	521.77	3,144.19	2.29	Non-mining
Khuvsgul	273.52	485.65	3,242.44	6.93	Non-mining
Orkhon	9,714.98	782.80	13,251.47	75.53	Mining
Selenge	1,279.24	483.35	5,042.28	27.11	Mining
Southgobi	2,682.00	1,783.80	6,671.04	40.00	Mining
Sukhbaatar	1,734.61	624.14	5,343.96	32.83	Mining
Tuv	456.65	547.02	4,557.51	8.08	Mining
Uvs	223.98	556.64	3,278.32	5.66	Non-mining
Uvurkhangai	103.92	461.30	2,951.84	3.12	Non-mining
Zavkhan	62.39	605.09	3,656.78	1.48	Non-mining

Note: All variables are in thousand Mongolian Tugrik (MNT) and on per capita basis. The figures are an average of annual data for the period 2010-2018. Provinces are defined as mining provinces if at least 8% of the provincial GDP comes from the mining sector.

TABLE A.2: **The effect of mining on sickness**

	Sick					
Variable name	(1)	(2)	(3)	(4)	(5)	(6)
ln(CSR spending) × mining	0.003	0.002	0.003	0.003	0.003	0.002
	(0.008)	(0.007)	(0.006)	(0.005)	(0.006)	(0.005)
Year=2012		-0.023**		-0.020**		-0.020**
		(0.011)		(0.010)		(0.009)
Year=2014		-0.014		-0.013		-0.012
		(0.010)		(0.008)		(0.008)
Year=2016		-0.030***		-0.027***		-0.026***
		(0.010)		(0.009)		(0.009)
Household head's age		0.002***		0.001***		0.001***
		(0.000)		(0.000)		(0.000)
Household head is male		-0.038***		-0.027***		-0.025***
		(0.009)		(0.007)		(0.006)
Household head is married		-0.007		-0.004		-0.004
		(0.007)		(0.007)		(0.006)
Proportion of working members		-0.036***		-0.028***		-0.027***
		(0.011)		(0.010)		(0.009)
Lives in apartment/house		0.019		0.014		0.012
		(0.013)		(0.009)		(0.008)
Lives in rural area		-0.035***		-0.031***		-0.027***
		(0.008)		(0.006)		(0.006)
Model	LPM	LPM	Probit	Probit	Logit	Logit
Province fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
R^2/Psedu R^2	0.01	0.04	0.01	0.07	0.01	0.07
Number of individuals	36,704	36,704	36,704	36,704	36,704	36,704

Note: 1. Sick is a dummy variable taking the value of one if a person felt sick in the past one month.
2. Marginal effects are calculated at means from all covariates in the linear probability (LPM), probit and logit models.
3. Standards errors, clustered at the 744 primary sampling units, are recorded in the parentheses.
* p <0.10, ** p <0.05, *** p <0.01.

TABLE A.3: **Effect of mining on educational attainment**

	OLS		Ordered-logit	
Variable	(1)	(2)	(3)	(4)
ln(CSR spending) × mining	0.173***	0.162***	0.207***	0.192***
	(0.058)	(0.043)	(0.062)	(0.047)
Year=2012	0.209**	0.230***	0.141	0.197**
	(0.082)	(0.068)	(0.088)	(0.081)
Year=2014	0.418***	0.448***	0.333***	0.421***
	(0.081)	(0.066)	(0.087)	(0.076)
Year=2016	0.634***	0.627***	0.560***	0.623***
	(0.079)	(0.070)	(0.088)	(0.083)
Household head's age		-0.018***		-0.025***
		(0.001)		(0.002)
Household head is married		0.448***		0.553***
		(0.045)		(0.051)
Household head is male		-0.408***		-0.386***
		(0.055)		(0.062)
Proportion of working members		0.069		-0.008
		(0.064)		(0.073)
Lives in apartment/house		1.663***		1.625***
		(0.087)		(0.087)
Lives in rural area		-0.693***		-0.887***
		(0.049)		(0.056)
Province fixed effects	Yes	Yes	Yes	Yes
Adjusted R^2 / Pseudo R^2	0.06	0.20	0.02	0.06
Number of households	10,353	10,353	10,353	10,353

Note: 1. All dependent variables are on monthly per capita basis and in real terms.
2. Standards errors, clustered at the 744 primary sampling units, are recorded in the parentheses.
* p <0.10, ** p <0.05, *** p <0.01.

TABLE A.4: **Effect of mining wages on income, food and non-food consumption**

	ln(income)		ln(food)		ln(non-food)	
Variable	(1)	(2)	(3)	(4)	(5)	(6)
ln(wage) × mining	0.031***	0.036***	0.033***	0.036***	0.027***	0.031***
	(0.009)	(0.007)	(0.008)	(0.006)	(0.008)	(0.007)
Year=2012	0.758***	0.823***	0.604***	0.671***	0.714***	0.774***
	(0.101)	(0.085)	(0.097)	(0.081)	(0.093)	(0.081)
Year=2014	0.881***	1.029***	0.699***	0.847***	0.869***	1.007***
	(0.099)	(0.078)	(0.094)	(0.074)	(0.091)	(0.073)
Year=2016	1.300***	1.293***	0.932***	0.934***	1.203***	1.194***
	(0.097)	(0.085)	(0.090)	(0.079)	(0.089)	(0.080)
Household head's age		0.045***		0.040***		0.040***
		(0.002)		(0.002)		(0.002)
Household head is married		-3.340***		-3.125***		-3.112***
		(0.107)		(0.099)		(0.099)
Household head is male		0.740***		0.715***		0.658***
		(0.125)		(0.116)		(0.116)
Proportion of working members		2.068***		1.849***		1.975***
		(0.119)		(0.109)		(0.113)
Lives in apartment/house		0.452***		0.335***		0.438***
		(0.094)		(0.084)		(0.090)
Lives in rural area		-0.292***		-0.230***		-0.316***
		(0.061)		(0.057)		(0.058)
Province fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.04	0.44	0.03	0.44	0.04	0.43
Number of households	10,353	10,353	10,353	10,353	10,353	10,353

Note: 1. All dependent variables are on monthly per capita basis and in real terms.
2. Education is controlled in the model but not reported.
3. Including age^2 does not affect the results.
4. Standards errors, clustered at the 744 primary sampling units, are recorded in the parentheses.
* p <0.10, ** p <0.05, *** p <0.01.

TABLE A.5: **Effect of mining wages on medical, education and energy expenditures**

	ln(medical)		ln(education)		ln(energy)	
Variable	(1)	(2)	(3)	(4)	(5)	(6)
ln(wage) × mining	0.021***	0.024***	-0.007*	-0.013***	0.017***	0.018***
	(0.006)	(0.005)	(0.004)	(0.003)	(0.006)	(0.005)
Year=2012	0.539***	0.547***	0.061	0.023	0.681***	0.685***
	(0.064)	(0.060)	(0.048)	(0.041)	(0.083)	(0.078)
Year=2014	0.730***	0.776***	-0.043	-0.106**	0.880***	0.938***
	(0.065)	(0.056)	(0.045)	(0.042)	(0.076)	(0.066)
Year=2016	1.079***	1.022***	-0.073	-0.132***	1.264***	1.181***
	(0.062)	(0.059)	(0.045)	(0.041)	(0.076)	(0.072)
Household head's age		0.039***		-0.033***		0.034***
		(0.001)		(0.001)		(0.002)
Household head is married		-1.951***		0.548***		-2.450***
		(0.066)		(0.039)		(0.084)
Household head is male		0.318***		-0.678***		0.436***
		(0.079)		(0.049)		(0.099)
Proportion of working members		0.961***		-0.727***		1.130***
		(0.079)		(0.049)		(0.093)
Lives in apartment/house		0.331***		0.008		0.133*
		(0.063)		(0.052)		(0.071)
Lives in rural area		-0.248***		-0.011		-0.416***
		(0.042)		(0.030)		(0.051)
Province fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.05	0.43	0.00	0.23	0.04	0.41
Number of households	10,353	10,353	10,353	10,353	10,353	10,353

Note: 1. All dependent variables are on monthly per capita basis and in real terms.
2. Education is controlled in the model but not reported.
3. Including age^2 does not affect the results.
4. Standards errors, clustered at the 744 primary sampling units, are recorded in the parentheses.
* p <0.10, ** p <0.05, *** p <0.01.

TABLE A.6: **Effect of mining wages on other expenditures**

	ln(clothing)		ln(services)		ln(transportation)	
Variable	(1)	(2)	(3)	(4)	(5)	(6)
ln(wage) × mining	0.021***	0.026***	0.010*	0.014**	0.006	0.011*
	(0.006)	(0.005)	(0.006)	(0.006)	(0.007)	(0.007)
Year=2012	0.643***	0.706***	-0.466***	-0.430***	0.873***	0.935***
	(0.075)	(0.068)	(0.076)	(0.078)	(0.085)	(0.083)
Year=2014	0.743***	0.876***	0.503***	0.573***	1.013***	1.141***
	(0.074)	(0.062)	(0.071)	(0.069)	(0.083)	(0.079)
Year=2016	0.980***	0.997***	0.784***	0.813***	1.294***	1.336***
	(0.072)	(0.066)	(0.077)	(0.073)	(0.085)	(0.084)
Household head's age		0.028***		0.005***		0.017***
		(0.002)		(0.002)		(0.002)
Household head is married		-2.502***		-0.925***		-2.110***
		(0.082)		(0.071)		(0.086)
Household head is male		0.496***		0.106		0.581***
		(0.095)		(0.078)		(0.101)
Proportion of working members		1.851***		1.298***		1.947***
		(0.096)		(0.099)		(0.111)
Lives in apartment/house		0.375***		0.314***		0.347***
		(0.072)		(0.089)		(0.082)
Lives in rural area		-0.242***		-0.327***		-0.317***
		(0.050)		(0.061)		(0.051)
Province fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.04	0.41	0.09	0.18	0.06	0.28
Number of households	10,353	10,353	10,353	10,353	10,353	10,353

Note: 1. All dependent variables are on monthly per capita basis and in real terms.
2. Education is controlled in the model but not reported.
3. Including age^2 does not affect the results.
4. Standards errors, clustered at the 744 primary sampling units, are recorded in the parentheses.
* p <0.10, ** p <0.05, *** p <0.01.

TABLE A.7: **Effect of local mining taxes on income, food and non-food consumption**

	ln(income)		ln(food)		ln(non-food)	
Variable	(1)	(2)	(3)	(4)	(5)	(6)
ln(local fees) × mining	0.160***	0.246***	0.180***	0.255***	0.121**	0.200***
	(0.061)	(0.052)	(0.057)	(0.047)	(0.058)	(0.050)
Year=2012	0.840***	0.925***	0.687***	0.769***	0.787***	0.865***
	(0.101)	(0.084)	(0.096)	(0.079)	(0.094)	(0.080)
Year=2014	0.906***	1.083***	0.718***	0.891***	0.899***	1.065***
	(0.100)	(0.078)	(0.094)	(0.074)	(0.092)	(0.074)
Year=2016	1.319***	1.297***	0.943***	0.932***	1.228***	1.206***
	(0.100)	(0.086)	(0.092)	(0.080)	(0.092)	(0.082)
Household head's age		-0.142***		-0.127***		-0.132***
		(0.012)		(0.012)		(0.012)
Household head is married		-3.165***		-2.969***		-2.951***
		(0.108)		(0.100)		(0.100)
Household head is male		0.623***		0.611***		0.550***
		(0.126)		(0.117)		(0.118)
Proportion of working members		2.283***		2.040***		2.172***
		(0.120)		(0.109)		(0.114)
Lives in apartment/house		0.464***		0.347***		0.449***
		(0.091)		(0.082)		(0.087)
Lives in rural area		-0.277***		-0.216***		-0.301***
		(0.060)		(0.056)		(0.058)
Province fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.03	0.46	0.03	0.46	0.04	0.45
Number of households	10,353	10,353	10,353	10,353	10,353	10,353

Note: 1. All dependent variables are on monthly per capita basis and in real terms.
2. Education is controlled in the model but not reported.
3. Including age^2 does not affect the results.
4. Standards errors, clustered at the 744 primary sampling units, are recorded in the parentheses.
* p <0.10, ** p <0.05, *** p <0.01.

TABLE A.8: **Effect of local mining taxes on medical, education and energy expenditures**

	ln(medical)		ln(education)		ln(energy)	
Variable	(1)	(2)	(3)	(4)	(5)	(6)
ln(local fees) × mining	0.117***	0.178***	-0.016	-0.067***	0.105**	0.161***
	(0.040)	(0.035)	(0.025)	(0.021)	(0.048)	(0.044)
Year=2012	0.592***	0.613***	0.038	-0.012	0.721***	0.734***
	(0.064)	(0.058)	(0.046)	(0.040)	(0.081)	(0.075)
Year=2014	0.741***	0.806***	-0.060	-0.124***	0.882***	0.958***
	(0.066)	(0.057)	(0.045)	(0.041)	(0.078)	(0.067)
Year=2016	1.084***	1.017***	-0.089**	-0.141***	1.262***	1.167***
	(0.064)	(0.060)	(0.045)	(0.042)	(0.081)	(0.073)
Household head's age		-0.090***		-0.004		-0.095***
		(0.008)		(0.006)		(0.010)
Household head is married		-1.829***		0.523***		-2.327***
		(0.066)		(0.039)		(0.085)
Household head is male		0.236***		-0.661***		0.353***
		(0.080)		(0.049)		(0.100)
Proportion of working members		1.111***		-0.757***		1.283***
		(0.079)		(0.050)		(0.094)
Lives in apartment/house		0.340***		0.005		0.141**
		(0.061)		(0.053)		(0.070)
Lives in rural area		-0.238***		-0.014		-0.406***
		(0.042)		(0.030)		(0.051)
Province fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.05	0.45	0.00	0.23	0.04	0.42
Number of households	10,353	10,353	10,353	10,353	10,353	10,353

Note: 1. All dependent variables are on monthly per capita basis and in real terms.
2. Education is controlled in the model but not reported.
3. Including age^2 does not affect the results.
4. Standards errors, clustered at the 744 primary sampling units, are recorded in the parentheses.
* p <0.10, ** p <0.05, *** p <0.01.

TABLE A.9: **Effect of local mining taxes on other expenditures**

	ln(clothing)		ln(services)		ln(transportation)	
Variable	(1)	(2)	(3)	(4)	(5)	(6)
ln(local fees) × mining	0.107**	0.171***	0.025	0.055	0.068	0.121***
	(0.049)	(0.043)	(0.044)	(0.042)	(0.051)	(0.046)
Year=2012	0.700***	0.779***	-0.435***	-0.387***	0.882***	0.960***
	(0.075)	(0.068)	(0.076)	(0.076)	(0.082)	(0.079)
Year=2014	0.762***	0.916***	0.525***	0.604***	0.998***	1.139***
	(0.075)	(0.063)	(0.072)	(0.070)	(0.083)	(0.078)
Year=2016	0.994***	1.003***	0.805***	0.834***	1.277***	1.314***
	(0.074)	(0.068)	(0.080)	(0.075)	(0.085)	(0.084)
Household head's age		-0.102***		-0.030***		-0.057***
		(0.010)		(0.009)		(0.013)
Household head is married		-2.381***		-0.895***		-2.038***
		(0.082)		(0.071)		(0.087)
Household head is male		0.415***		0.087		0.532***
		(0.096)		(0.079)		(0.101)
Proportion of working members		1.999***		1.332***		2.038***
		(0.097)		(0.100)		(0.112)
Lives in apartment/house		0.383***		0.318***		0.351***
		(0.071)		(0.088)		(0.081)
Lives in rural area		-0.231***		-0.323***		-0.312***
		(0.050)		(0.060)		(0.051)
Province fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.04	0.42	0.09	0.18	0.06	0.29
Number of households	10,353	10,353	10,353	10,353	10,353	10,353

Note: 1. All dependent variables are on monthly per capita basis and in real terms.
2. Education is controlled in the model but not reported.
3. Including age^2 does not affect the results.
4. Standards errors, clustered at the 744 primary sampling units, are recorded in the parentheses.
* p <0.10, ** p <0.05, *** p <0.01.

Appendix B: Tables for the Referees – Income included as the control variable

TABLE B.1: **Effect of mining on food and non-food consumption**

	ln(food)		ln(non-food)	
Variable	(1)	(2)	(3)	(4)
ln(CSR spending) × mining	0.208***	0.027***	0.166***	-0.017***
	(0.062)	(0.007)	(0.063)	(0.007)
Year=2012	0.619***	-0.084***	0.728***	0.001
	(0.097)	(0.012)	(0.093)	(0.015)
Year=2014	0.750***	-0.091***	0.913***	0.039***
	(0.091)	(0.010)	(0.089)	(0.013)
Year=2016	0.938***	-0.252***	1.211***	-0.019
	(0.092)	(0.011)	(0.091)	(0.013)
Per capita income		0.916***		0.938***
		(0.002)		(0.002)
Household head's age		-0.002***		-0.002***
		(0.000)		(0.000)
Household head is married		-0.067***		0.020*
		(0.010)		(0.011)
Household head is male		0.038***		-0.036***
		(0.012)		(0.012)
Proportion of working members		-0.045***		0.037**
		(0.015)		(0.014)
Lives in apartment/house		-0.079***		0.014
		(0.012)		(0.010)
Lives in rural area		0.037***		-0.041***
		(0.008)		(0.008)
Province fixed effects	Yes	Yes	Yes	Yes
Adjusted R^2	0.03	0.99	0.04	0.99
Number of households	10,353	10,353	10,353	10,353

Note: 1. All dependent variables are on monthly per capita basis and in real terms.
2. Education is controlled in the model but not reported.
3. Including age^2 does not affect the results.
4. Standards errors, clustered at the 744 primary sampling units, are recorded in the parentheses.
* p <0.10, ** p <0.05, *** p <0.01.

TABLE B.2: **Effect of mining on medical, education and energy expenditures**

	ln(medical)		ln(education)		ln(energy)	
Variable	(1)	(2)	(3)	(4)	(5)	(6)
ln(CSR spending) × mining	0.124***	0.009	-0.037	-0.039	0.109**	-0.045***
	(0.045)	(0.018)	(0.029)	(0.024)	(0.047)	(0.015)
Year=2012	0.553***	0.037	0.053	0.158***	0.687***	0.064*
	(0.064)	(0.032)	(0.048)	(0.042)	(0.083)	(0.035)
Year=2014	0.766***	0.139***	-0.057	0.057	0.905***	0.156***
	(0.063)	(0.029)	(0.043)	(0.039)	(0.074)	(0.032)
Year=2016	1.087***	0.219***	-0.079*	0.084**	1.266***	0.212***
	(0.063)	(0.030)	(0.045)	(0.041)	(0.078)	(0.033)
Per capita income		0.621***		-0.169***		0.745***
		(0.005)		(0.006)		(0.005)
Household head's age		0.011***		-0.025***		0.001
		(0.001)		(0.001)		(0.001)
Household head is married		0.125***		-0.016		0.039*
		(0.022)		(0.039)		(0.021)
Household head is male		-0.142***		-0.553***		-0.116***
		(0.029)		(0.044)		(0.027)
Proportion of working members		-0.324***		-0.375***		-0.407***
		(0.032)		(0.047)		(0.033)
Lives in apartment/house		0.050**		0.084*		-0.204***
		(0.025)		(0.050)		(0.023)
Lives in rural area		-0.067***		-0.061**		-0.199***
		(0.019)		(0.029)		(0.017)
Province fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.05	0.92	0.00	0.32	0.04	0.95
Number of households	10,353	10,353	10,353	10,353	10,353	10,353

Note: 1. All dependent variables are on monthly per capita basis and in real terms.
2. Education is controlled in the model but not reported.
3. Including age^2 does not affect the results.
4. Standards errors, clustered at the 744 primary sampling units, are recorded in the parentheses.
* p <0.10, ** p <0.05, *** p <0.01.

TABLE B.3: **Effect of local mining taxes on income and other expenditures**

	ln(clothing)		ln(services)		ln(transportation)	
Variable	(1)	(2)	(3)	(4)	(5)	(6)
ln(CSR spending) × mining	0.132***	-0.011	0.157***	0.101**	0.043	-0.082**
	(0.051)	(0.012)	(0.047)	(0.039)	(0.055)	(0.033)
Year=2012	0.655***	0.100***	-0.507***	-0.734***	0.874***	0.399***
	(0.075)	(0.024)	(0.077)	(0.080)	(0.084)	(0.064)
Year=2014	0.779***	0.116***	0.490***	0.221***	1.021***	0.457***
	(0.073)	(0.024)	(0.069)	(0.066)	(0.080)	(0.057)
Year=2016	0.986***	0.045**	0.736***	0.355***	1.294***	0.499***
	(0.073)	(0.021)	(0.079)	(0.070)	(0.086)	(0.062)
Per capita income		0.739***		0.321***		0.648***
		(0.006)		(0.013)		(0.009)
Household head's age		-0.006***		-0.009***		-0.012***
		(0.001)		(0.002)		(0.001)
Household head is married		-0.034		0.151***		0.056
		(0.033)		(0.056)		(0.045)
Household head is male		-0.050		-0.135*		0.100
		(0.035)		(0.073)		(0.067)
Proportion of working members		0.322***		0.642***		0.610***
		(0.041)		(0.095)		(0.080)
Lives in apartment/house		0.041		0.167**		0.054
		(0.026)		(0.078)		(0.046)
Lives in rural area		-0.026		-0.235***		-0.128***
		(0.018)		(0.057)		(0.033)
Province fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.04	0.94	0.09	0.34	0.06	0.70
Number of households	10,353	10,353	10,353	10,353	10,353	10,353

Note: 1. All dependent variables are on monthly per capita basis and in real terms.
2. Education is controlled in the model but not reported.
3. Including age^2 does not affect the results.
4. Standards errors, clustered at the 744 primary sampling units, are recorded in the parentheses.
* p <0.10, ** p <0.05, *** p <0.01.

Appendix C: Tables for the Referees – Square root of household size

TABLE C.1: **Effect of mining on income, food and non-food consumption**

	ln(income)		ln(food)		ln(non-food)	
Variable	(1)	(2)	(3)	(4)	(5)	(6)
ln(CSR spending) × mining	0.124**	0.150***	0.162***	0.182***	0.086*	0.108***
	(0.050)	(0.042)	(0.045)	(0.037)	(0.046)	(0.040)
Year=2012	0.761***	0.813***	0.516***	0.574***	0.693***	0.740***
	(0.072)	(0.061)	(0.068)	(0.057)	(0.066)	(0.060)
Year=2014	0.894***	1.006***	0.627***	0.745***	0.875***	0.974***
	(0.068)	(0.055)	(0.064)	(0.052)	(0.062)	(0.053)
Year=2016	1.197***	1.203***	0.677***	0.698***	1.078***	1.080***
	(0.071)	(0.063)	(0.065)	(0.057)	(0.064)	(0.060)
Household head's age		0.034***		0.028***		0.028***
		(0.001)		(0.001)		(0.001)
Household head is married		-2.195***		-2.068***		-2.002***
		(0.070)		(0.065)		(0.064)
Household head is male		0.437***		0.425***		0.370***
		(0.081)		(0.076)		(0.075)
Proportion of working members		1.659***		1.430***		1.572***
		(0.079)		(0.071)		(0.075)
Lives in apartment/house		0.432***		0.274***		0.417***
		(0.066)		(0.057)		(0.063)
Lives in rural area		-0.228***		-0.136***		-0.270***
		(0.043)		(0.041)		(0.042)
Province fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.06	0.44	0.03	0.43	0.06	0.42
Number of households	10,353	10,353	10,353	10,353	10,353	10,353

Note: 1. All dependent variables are on monthly per capita basis and in real terms.
2. Education is controlled in the model but not reported.
3. Including age^2 does not affect the results.
4. Clustered standard errors are reported in the parentheses.
* p <0.10, ** p <0.05, *** p <0.01.

TABLE C.2: **Effect of mining on medical, education and energy expenditures**

	ln(medical)		ln(education)		ln(energy)	
Variable	(1)	(2)	(3)	(4)	(5)	(6)
ln(CSR spending) × mining	0.078**	0.101***	-0.085*	-0.154***	0.056	0.060*
	(0.040)	(0.035)	(0.051)	(0.042)	(0.041)	(0.037)
Year=2012	0.573***	0.562***	-0.050	-0.123*	0.708***	0.680***
	(0.059)	(0.056)	(0.087)	(0.071)	(0.080)	(0.074)
Year=2014	0.811***	0.818***	-0.183**	-0.324***	0.979***	0.983***
	(0.054)	(0.051)	(0.079)	(0.072)	(0.068)	(0.060)
Year=2016	1.136***	1.071***	-0.304***	-0.406***	1.327***	1.214***
	(0.054)	(0.053)	(0.080)	(0.073)	(0.071)	(0.065)
Household head's age		0.035***		-0.057***		0.026***
		(0.001)		(0.002)		(0.001)
Household head is married		-1.252***		1.352***		-1.652***
		(0.048)		(0.066)		(0.060)
Household head is male		0.173***		-1.020***		0.209***
		(0.056)		(0.079)		(0.070)
Proportion of working members		0.661***		-1.601***		0.687***
		(0.060)		(0.082)		(0.068)
Lives in apartment/house		0.345***		-0.084		0.001
		(0.053)		(0.086)		(0.056)
Lives in rural area		-0.249***		0.046		-0.490***
		(0.038)		(0.052)		(0.045)
Province fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.09	0.40	0.01	0.29	0.08	0.39
Number of households	10,353	10,353	10,353	10,353	10,353	10,353

Note: 1. All dependent variables are on monthly per capita basis and in real terms.
2. Education is controlled in the model but not reported.
3. Including age^2 does not affect the results.
4. Standards errors, clustered at the 744 primary sampling units, are recorded in the parentheses.
* p <0.10, ** p <0.05, *** p <0.01.

TABLE C.3: **Effect of mining on other expenditures**

	ln(clothing)		ln(services)		ln(transportation)	
Variable	(1)	(2)	(3)	(4)	(5)	(6)
ln(CSR spending) × mining	0.063*	0.082**	0.117**	0.136**	-0.088	-0.070
	(0.037)	(0.033)	(0.058)	(0.054)	(0.055)	(0.051)
Year=2012	0.661***	0.715***	-1.046***	-1.007***	1.098***	1.158***
	(0.054)	(0.052)	(0.118)	(0.117)	(0.105)	(0.104)
Year=2014	0.772***	0.875***	0.524***	0.589***	1.238***	1.345***
	(0.052)	(0.047)	(0.099)	(0.096)	(0.096)	(0.093)
Year=2016	0.870***	0.903***	0.703***	0.746***	1.444***	1.505***
	(0.053)	(0.050)	(0.112)	(0.104)	(0.106)	(0.105)
Household head's age		0.016***		-0.002		0.007***
		(0.001)		(0.002)		(0.002)
Household head is married		-1.523***		-0.265***		-1.178***
		(0.054)		(0.074)		(0.070)
Household head is male		0.229***		-0.033		0.416***
		(0.063)		(0.085)		(0.085)
Proportion of working members		1.506***		1.247***		1.720***
		(0.066)		(0.108)		(0.099)
Lives in apartment/house		0.351***		0.357***		0.340***
		(0.053)		(0.114)		(0.080)
Lives in rural area		-0.191***		-0.415***		-0.335***
		(0.039)		(0.084)		(0.050)
Province fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.06	0.36	0.12	0.17	0.09	0.21
Number of households	10,353	10,353	10,353	10,353	10,353	10,353

Note: 1. All dependent variables are on monthly per capita basis and in real terms.
2. Education is controlled in the model but not reported.
3. Including age^2 does not affect the results.
4. Standards errors, clustered at the 744 primary sampling units, are recorded in the parentheses.
* p <0.10, ** p <0.05, *** p <0.01.

Appendix D: Tables for the Referees –Modified OECD equivalence

TABLE D.1: **Effect of mining on income, food and non-food consumption**

	ln(income)		ln(food)		ln(non-food)	
Variable	(1)	(2)	(3)	(4)	(5)	(6)
ln(CSR spending) × mining	0.166***	0.176***	0.198***	0.202***	0.129**	0.135***
	(0.056)	(0.048)	(0.052)	(0.043)	(0.052)	(0.045)
Year=2012	0.769***	0.823***	0.539***	0.597***	0.706***	0.754***
	(0.086)	(0.074)	(0.083)	(0.070)	(0.080)	(0.072)
Year=2014	0.898***	1.022***	0.643***	0.772***	0.878***	0.991***
	(0.080)	(0.068)	(0.076)	(0.064)	(0.074)	(0.064)
Year=2016	1.251***	1.269***	0.753***	0.784***	1.134***	1.148***
	(0.085)	(0.078)	(0.080)	(0.072)	(0.079)	(0.074)
Household head's age		0.020***		0.015***		0.016***
		(0.002)		(0.002)		(0.002)
Household head is married		-2.490***		-2.342***		-2.288***
		(0.087)		(0.082)		(0.081)
Household head is male		0.248**		0.251***		0.188**
		(0.096)		(0.091)		(0.090)
Proportion of working members		1.638***		1.419***		1.557***
		(0.093)		(0.085)		(0.088)
Lives in apartment/house		0.498***		0.341***		0.481***
		(0.075)		(0.066)		(0.072)
Lives in rural area		-0.254***		-0.167***		-0.292***
		(0.050)		(0.047)		(0.048)
Province fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.05	0.40	0.03	0.39	0.05	0.38
Number of households	10,353	10,353	10,353	10,353	10,353	10,353

Note: 1. All dependent variables are on monthly per capita basis and in real terms.
2. Education is controlled in the model but not reported.
3. Including age^2 does not affect the results.
4. Clustered standard errors are reported in the parentheses.
* p <0.10, ** p <0.05, *** p <0.01.

TABLE D.2: **Effect of mining on medical, education and energy expenditures**

	ln(medical)		ln(education)		ln(energy)	
Variable	(1)	(2)	(3)	(4)	(5)	(6)
ln(CSR spending) × mining	0.103**	0.116***	-0.063	-0.135***	0.081*	0.076*
	(0.041)	(0.037)	(0.049)	(0.040)	(0.043)	(0.039)
Year=2012	0.582***	0.574***	0.003	-0.064	0.728***	0.705***
	(0.063)	(0.060)	(0.084)	(0.071)	(0.082)	(0.078)
Year=2014	0.812***	0.829***	-0.133*	-0.256***	0.980***	0.998***
	(0.057)	(0.054)	(0.078)	(0.071)	(0.069)	(0.063)
Year=2016	1.161***	1.104***	-0.204**	-0.286***	1.360***	1.262***
	(0.058)	(0.057)	(0.081)	(0.074)	(0.074)	(0.071)
Household head's age		0.027***		-0.061***		0.016***
		(0.001)		(0.002)		(0.001)
Household head is married		-1.422***		1.151***		-1.847***
		(0.054)		(0.069)		(0.069)
Household head is male		0.039		-1.125***		0.059
		(0.063)		(0.078)		(0.079)
Proportion of working members		0.650***		-1.465***		0.695***
		(0.066)		(0.081)		(0.077)
Lives in apartment/house		0.383***		-0.024		0.067
		(0.056)		(0.080)		(0.061)
Lives in rural area		-0.259***		0.019		-0.487***
		(0.040)		(0.047)		(0.048)
Province fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.08	0.38	0.00	0.28	0.07	0.37
Number of households	10,353	10,353	10,353	10,353	10,353	10,353

Note: 1. All dependent variables are on monthly per capita basis and in real terms.
2. Education is controlled in the model but not reported.
3. Including age^2 does not affect the results.
4. Standards errors, clustered at the 744 primary sampling units, are recorded in the parentheses.
* p <0.10, ** p <0.05, *** p <0.01.

TABLE D.3: **Effect of mining on other expenditures**

	ln(clothing)		ln(services)		ln(transportation)	
Variable	(1)	(2)	(3)	(4)	(5)	(6)
ln(CSR spending) × mining	0.103**	0.116***	-0.063	-0.135***	0.081*	0.076*
	(0.041)	(0.037)	(0.049)	(0.040)	(0.043)	(0.039)
Year=2012	0.582***	0.574***	0.003	-0.064	0.728***	0.705***
	(0.063)	(0.060)	(0.084)	(0.071)	(0.082)	(0.078)
Year=2014	0.812***	0.829***	-0.133*	-0.256***	0.980***	0.998***
	(0.057)	(0.054)	(0.078)	(0.071)	(0.069)	(0.063)
Year=2016	1.161***	1.104***	-0.204**	-0.286***	1.360***	1.262***
	(0.058)	(0.057)	(0.081)	(0.074)	(0.074)	(0.071)
Household head's age		0.027***		-0.061***		0.016***
		(0.001)		(0.002)		(0.001)
Household head is married		-1.422***		1.151***		-1.847***
		(0.054)		(0.069)		(0.069)
Household head is male		0.039		-1.125***		0.059
		(0.063)		(0.078)		(0.079)
Proportion of working members		0.650***		-1.465***		0.695***
		(0.066)		(0.081)		(0.077)
Lives in apartment/house		0.383***		-0.024		0.067
		(0.056)		(0.080)		(0.061)
Lives in rural area		-0.259***		0.019		-0.487***
		(0.040)		(0.047)		(0.048)
Province fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.08	0.38	0.00	0.28	0.07	0.37
Number of households	10,353	10,353	10,353	10,353	10,353	10,353

Note: 1. All dependent variables are on monthly per capita basis and in real terms.
2. Education is controlled in the model but not reported.
3. Including age^2 does not affect the results.
4. Standards errors, clustered at the 744 primary sampling units, are recorded in the parentheses.
* p <0.10, ** p <0.05, *** p <0.01.