Diffusion of Economic Shocks in the Labor Market: Evidence from a Mining Boom and Bust

Gabriel Rodríguez-Puello[1*] and Jonna Rickardsson[1]

[1]Centre for Entrepreneurship and Spatial Economics (CEnSE), Jönköping International Business School (JIBS), Jönköping University, Sweden

February 19, 2025

Abstract

We study the effects of a local economic shock on the labor market and its diffusion across space, time, and economic sectors. Utilizing the mining boom of 2004, geocoded administrative microdata in Sweden, and dynamic difference-in-differences, we find short- and long-lasting positive effects on earnings, that increase over time and spread as far as 83 km from the mines. We find direct effects on earnings and employment for workers in the mining sector, accompanied by positive spillover effects in earnings in other sectors (such as manufacturing, construction, and services). However, the service and construction sectors experience negative employment effects, likely caused by higher competition for workers.

JEL classification: J61, R23, Q33, O13

Keywords: economic shock, mining boom, spatial diffusion, labor market

*Corresponding author. Email: gabriel.rodriguez@ju.se. The authors are grateful to Paul Nystedt, Orsa Kekezi, Sofia Wixe, Erwan Dujeancourt, Maren Holthe Hedne, Steven Poelhekke, and Anja Benshaul-Tolonen for their valuable comments and suggestions in earlier versions of this article. We also benefited from helpful comments by participants at the internal seminars at Jönköping International Business School (JIBS), the publishing CEnSE writing group organized by the Centre for Entrepreneurship and Spatial Economics (CEnSE), the Department of Spatial Economics at VU Amsterdam, the European Regional Science Association (ERSA) Congress, Nordic Association of Environmental and Resource Economics (NAERE) Workshop, the Western Regional Science Association (WRSA) Congress, and the 8th CEnSE Workshop. We thank Statistics Sweden for its support regarding the data. The data used in this article have restricted access; individuals interested in accessing the data can contact the corresponding author for additional details. This paper previously circulated under the title "Spatial Diffusion of Economic Shocks in the Labor Market: Evidence from a mining boom and bust". All remaining errors are our own.

1 Introduction

How are people affected by local economic shocks? In recent decades, there has been considerable debate about the effects of both positive and negative economic shocks -such as the Great Recession, the fracking boom, and trade liberalization- on labor markets and local communities (Autor et al., 2013; Franklin and Labonne, 2019; Foote et al., 2019). However, while extensive literature has explored the aggregate effects of economic shocks on countries, regions, and labor markets (Feyrer et al., 2017), less attention has been given to their impact on individuals (Jacobsen et al., 2023). To fully comprehend the mechanisms underlying these aggregate effects, it is crucial to analyze the effects at the individual level, as well as over geography and time.

In this paper, we study the effects of a positive economic shock on individual labor market outcomes, using Sweden and the 2004 mining boom as study cases. During the mining boom, countries and local communities that are highly dependent on natural resources experienced substantial economic (income) shocks due to the unexpected surge in international resource prices (Baffes and Haniotis, 2010; Erten and Ocampo, 2013). We examine the diffusion of the effects of this recent economic shock on individuals' earnings and employment by utilizing geocoded register data on the full Swedish population for the years 2000 to 2015, covering both the boom and bust phases. First, we explore the spatial diffusion of the shock, analyzing how the effects of exposure to the mining boom spread geographically with residential distance to the mines. Second, we evaluate *who* is affected by such exposure by examining how the impacts of the shock vary across different economic sectors and demographic groups. We start examining the direct effects on mining workers versus the spillover effects on other economic sectors, and heterogeneity by individual characteristics, e.g., educational levels. A more comprehensive understanding of the labor market effects of resource shocks is of long-standing interest to social scientists and policymakers, who are interested in knowing whether and for whom natural resources are either a blessing or a curse (Ploeg, 2011; Cust and Poelhekke, 2015; Jacobsen and Parker, 2016; Pelzl and Poelhekke, 2021).

The mining boom was driven by a large increase in the international price of minerals, which suddenly tripled (Baffes and Haniotis, 2010). The prices of resources continued to increase until 2011, after which they declined until 2015 (SGU, 2021). The mining boom can be divided into a preboom period (before 2004), a boom phase (2004-2011), and a bust phase (2011-2015) according to the evolution of international mining prices (Chávez and Rodríguez-Puello, 2022). After 2015, the international prices of resources stabilized. According to the literature, this shock is considered exogenous to the Swedish mining industry because it was generated by China's increasing demand for commodities (Kaplinsky, 2006; Radetzki et al., 2008; Farooki and Kaplinsky, 2013) and speculation in the stock markets that generated investor flow (Singleton, 2014), not induced by shifts in the supply of minerals (Erten and Ocampo, 2013). In addition, geographic exposure to the shock was largely defined by the geological location of resources (Brunnschweiler and Bulte, 2008; Van der Ploeg and Poelhekke, 2010) and not the initial labor market conditions. The mining sector in Sweden is concentrated in the northern part of the country, which has experienced decades of disinvestment and population decline (Adjei et al., 2023) and is characterized by being a remote and sparsely populated rural area with low population density. Northern Sweden has a long tradition of iron ore mining (Haley et al., 2011; Tano et al., 2016). Estimates indicate that in 2013, the mining industry contributed almost SEK 44 billion (1.3 percent) to the Swedish GDP, and Sweden is considered one of the most attractive mining countries in the world (Swedish Agency for Growth Policy Analysis, 2015). We restrict our analysis to Sweden's three operating iron ore mines, which are the largest mines and represent not only all of the country's iron ore extraction but also a significant majority of the country's mining employment.

We identify the effects of the mining boom by estimating dynamic difference-in-differences models that compare individuals near mines with those located farther away, both before and after the mining boom and bust.[1] The rich Swedish administrative data enable us to link the detailed individual-level labor market conditions of all Swedish residents with demographic characteristics and geographical information. Having access to this population-based information at the individual level is an important advantage compared with most previous studies that investigated the relationship between economic shocks and labor market outcomes but were forced to rely on aggregated data. Given these data and the study design employed, this study thus provides a comprehensive understanding of what happens at a very granular level, providing important insights into broader, aggregated outcomes.

Three major results emerge from our analysis. First, individuals located near mines enjoy significant economic benefits from the resource shock. For example, for those individuals located very close to the mines (0 km - 3.16 km), we observe an average increase of 8,377 SEK (approximately 930 EUR at the time) for yearly earnings the first year after the shock (2004), compared with those located farther away (131.34 km - 150.00 km).[2] This effect represents a 5.22% increase from the average earnings in this group (0 km - 3.16 km) in the year 2003 (160,566 SEK). Second, there is evidence of a significant spatial propagation of the effects of the economic shock. The mining boom affects individuals living up to 83 kilometers from the mines. These positive effects increase with time, providing evidence of a long-lasting effect of the mining boom (temporary economic shock) that appears unaffected by the bust. Third, consistent with previous work, the magnitudes of earning adjustments differ substantially across economic and demographic groups. As expected, we find evidence

[1]In the entirety of the paper, when we mention individuals' location, we refer to the residential location. If any different case is examined, such differences are clearly stated. Moreover, when we mention the mining boom, we refer to the economic shock, which is composed of both boom and bust phases.

[2]Monetary values are converted to EUR via the observed conversion rate from 31/Dec/2004, i.e., 0.111 SEK/EUR.

of a large gain in earnings and employment for residents directly employed in the mining sector. For example, there is an average increase of 14,370 SEK (approximately 1,595 EUR at the time) for yearly earnings for workers in the mining sector the first year after the shock (2004), compared with workers in other sectors. We also observe significant spillover effects on the earnings of individuals in other sectors. Workers in the manufacturing, construction, and service sectors experience a significant increase in earnings because of the mining boom.

Overall, these results suggest important improvements in the labor market conditions of the local population of mining areas, due to the effects of the resource shock that persist over time and spread across geographic and economic sectors; the findings suggest that mining activity spills over to the remaining economy. We further perform falsification tests to verify the robustness of our results. These robustness tests support the interpretation that our identification strategy isolates the economic shock effects caused by the mining boom rather than other temporal confounds.

Our paper contributes to different strands of literature. There is rapidly developing literature on the labor market consequences of economic shocks in general, the effects of resource shocks in particular, and whether natural resources are a blessing or a curse (Ploeg, 2011; Autor et al., 2013; Franklin and Labonne, 2019; Rodríguez-Puello, 2025). The broad literature on economic shocks encompasses diverse and multifaceted effects of economic downturns and labor market disruptions (Autor et al., 2013; Franklin and Labonne, 2019). Previous studies on shocks unrelated to natural resources, such as trade liberalization and the COVID-19 pandemic, have commonly analyzed "negative" shocks with adverse, sector-specific labor market consequences. The literature that focuses specifically on resource shocks, such as fracking and mining booms, and the economic implications of resource abundance cover both the positive and negative effects of booms and busts (Feyrer et al., 2017; Jacobsen et al., 2023). By focusing on people rather than places (Cust and Poelhekke, 2015; Jacobsen and Parker, 2016; Pelzl and Poelhekke, 2021), we contribute to this body of research with evidence of how sectoral booms and busts affect labor markets in several ways.

First, the growing literature on people rather than places has moved with time from analyses focused on places on the country level and the subnational level and, more recently, has focused more on the people involved (Guettabi and James, 2020; Kovalenko, 2023; Jacobsen et al., 2023). Place-based analysis may provide misleading policy decisions because it is difficult to identify and account for mobility across space and economic sectors. In contrast to the vast majority of previous studies, the data and study design in this paper allow us examine more in depth how local economic shocks diffuse in the labor market across space, time, economic sectors and demographic groups.

Second, we contribute to the literature on the spatial diffusion of economic shocks, which is surprisingly scant (Feyrer et al., 2017; Diemer, 2024; Amarasinghe et al., 2024). One reason for this lack may be that measuring geographic spillovers from an economic shock remains a challenging econometric problem (Feyrer et al., 2020). Previous studies that have analyzed the spatial propagation of economic shocks have done so at an aggregate level, using different levels of aggregation for spatial diffusion combined with spatial econometric techniques (Feyrer et al., 2017; Allcott and Keniston, 2018; Wang et al., 2019; Mamo et al., 2019; James and Smith, 2020; Diemer, 2024; Amarasinghe et al., 2024). For example, Richter et al. (2018) and Feyrer et al. (2017) both examine the spatial impact of energy booms using counties as the primary unit of analysis. The authors find that the economic effects of the Bakken oil boom and the fracking revolution are most pronounced within 100 miles ($\sim$ 161 km) of the activity, with Richter et al. (2018) noting that spillovers extend even beyond this range. Nevertheless, using an aggregated level of analysis, such as counties as in the examples above, can bias or hide important results. For example, counties or municipalities may not be the ideal level of observation, as workers and landowners might be located in areas adjacent to where mineral production or mining is occurring (Feyrer et al., 2017). Hence, the effects may vary within these geographic entities, which an aggregated analysis may fail to capture. We contribute to this literature by using individual-level geocoded data and new econometric techniques (Butts, 2023) that use the distance to mines to document the size and breadth of geographic spillovers from localized economic activity. Moreover, as far as we know, all the previous literature has focused on the energy and gas sector and the fracking boom. There is no specific evidence regarding the spatial propagation of mining booms.

Third, in contrast to most previous studies, we examine sectoral diffusion effects more deeply. While previous studies on negative economic shocks unrelated to natural resources tend to find small or transient diffusion effects into unaffected sectors (Autor et al., 2013; Chetty et al., 2023), studies on resource shocks, especially oil and gas, have identified both negative (crowding out) and positive sectoral spillover effects (Gelb et al., 1988; Auty, 1990; Black et al., 2005a; Jacobsen and Parker, 2016; Tano et al., 2016; Feyrer et al., 2017; Allcott and Keniston, 2018). However, most studies on spillover effects from resource development are unable to control for endogenous geographical and sectoral mobility, which may affect their findings (Miller, 2023). Additionally, to further improve our understanding of *who* benefits, i.e., if the effects are concentrated in specific population groups, we examine heterogeneous effects across various demographic groups. Previous studies have identified heterogeneous effects according to educational level, gender, and age (Benshaul-Tolonen et al., 2019; Pérez and Rodríguez-Puello, 2022; Chávez and Rodríguez-Puello, 2022). Our results are consistent with those of previous studies and reinforce findings suggesting that the role of educational level varies between developed and developing countries. We contribute to this literature by examining both earnings and employment effects across sectors, geography, and demographic groups, providing a deeper understanding of these varied effects of the boom on the whole labor market.

Finally, this work contributes to the literature on the temporal diffusion of the effects of economic shocks by examining labor market effects over time, both in the boom and bust periods, as most of the previous literature has focused on the short run (Aragón and Rud, 2013; Caselli and Michaels, 2013; Brown et al., 2016; Bartik et al., 2019). Considering that resource booms involve different phases and are considered temporary, providing evidence of the short-, medium-, and long-term consequences of these shocks is highly relevant (Jacobsen et al., 2023). While the larger literature focusing on the short-term effects of resource booms tends to find that local economies benefit from booms in terms of employment, wages, and earnings (Aragón and Rud, 2013; Caselli and Michaels, 2013; Brown et al., 2016; Bartik et al., 2019), the smaller literature that has evaluated both the boom and bust phases of resource shocks finds evidence that the benefits of booms are usually lower than the losses from busts (Black et al., 2005b; James and Aadland, 2011; Jacobsen and Parker, 2016; Jacobsen et al., 2023). Aragón et al. (2018) study the closure of coal mines in the UK since 1984, and find differentiated effects by gender, in which employment in manufacturing and services increases for men, but decreases for women. These effects persist more than 20 years after mine closures. In contrast to this research, but in consensus with the study by Kovalenko (2023), we contribute to this literature by providing evidence of persistent positive earnings effects that seem relatively unaffected by the bust.

The rest of the paper is organized as follows. Section 2 presents the data, sample, and period of analysis and presents the empirical methodology. Section 3 presents the empirical results. Finally, in Section 4, a discussion of the findings and conclusions can be found.

2 Data and research design

2.1 Data

In our main analysis, we use geocoded microdata originating from administrative registers. Specifically, data on linked employer-employee administrative records on the entire universe of individuals in Sweden from the Longitudinal Integrated Database for Health Insurance and Labor Market Studies (LISA), provided by Statistics Sweden. These data include a large set of third-party reported information on the labor market situation of individuals (earnings, employment situation, and industries, among others), demographic characteristics (year of birth, gender, schooling, and marital status, among others), and geographic factors (urban and rural locations and place of residence, among others). These longitudinal data are individual-by-year-level data for all individuals aged 16 years or older residing in Sweden each year, allowing us to track individuals over time. Among other benefits, these data from administrative registers of Swedish citizens have the benefit of there being no scope for selection into or out of the sample; thus, there is hardly any attrition in the data (Åkerlund et al., 2016). We use data for the 2000-2015 period and keep individuals who appear in five or more annual observations consecutively in the sample. We restrict the sample to individuals older than 18 years and under 65 years. The main sample consists of approximately 566,165 individuals*year observations or 35,385 individuals.

2.2 Measuring exposure to the shock

In the resource economics literature, the mining shock analyzed is assumed to be exogenous because it was generated mainly by demand shifts and not supply shifts (Radetzki et al., 2008; Erten and Ocampo, 2013; Farooki and Kaplinsky, 2013; Singleton, 2014). Specifically, its main causes were China's increasing demand for commodities (Radetzki et al., 2008; Farooki and Kaplinsky, 2013) and speculation in stock markets that generated investor flow (Singleton, 2014). Figure 1 shows the international prices and Swedish production of iron ore for the 2000-2018 period, which includes the boom that we study, as well as the analyzed bust. Iron ore is the most important mineral in the Swedish mining economy, and Sweden is dominant in iron ore mining at both the European and international levels (SGU, 2021). Prices began to increase in 2004, reaching the maximum level in 2011. The price of iron ore increased by 71.1% from 2004 to 2005 and continued to grow rapidly in the following years (Tano et al., 2016). Both the price spike and its subsequent collapse were unanticipated (Erten and Ocampo, 2013). The price increases translated, with some lags, into volatility in production and an increase in exploration activities (Knobblock and Pettersson, 2010; SGU, 2014). Following previous literature and this descriptive evidence, we use 2004 as the starting point of the mining boom because it is the year when the price of minerals started to rapidly increase. In addition, the number of mining jobs had a negative trend until 2003, started to increase in 2004, and continued to grow over the coming years (SGU, 2014; Knobblock and Pettersson, 2010). This trend was accompanied by an increase in investment in the Swedish mining sector. Therefore, the period between 2000 and 2003 can be considered the preboom period, the boom phase is defined as being between 2004 and 2011, and the bust phase is defined as being between 2012 and 2015. We can also see in the figure that prices declined until 2015, after which they stabilized. To capture both the preboom, boom, and bust phases, we analyze the period from 2000 to 2015.

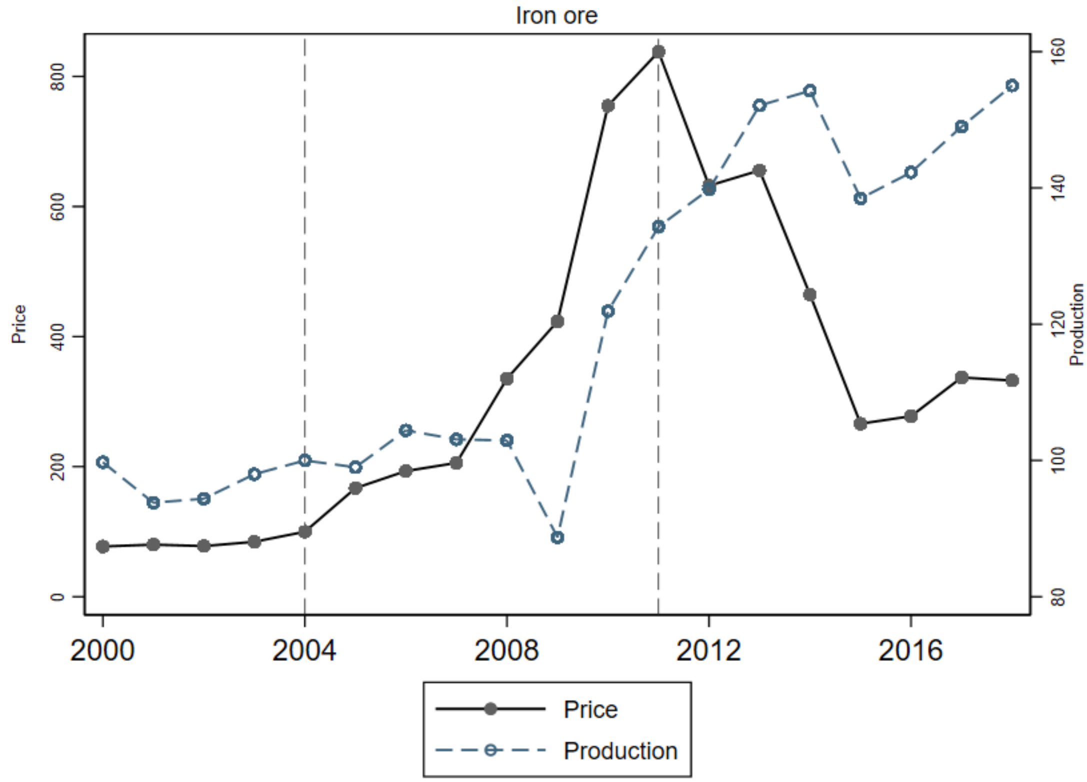


Figure 1: Price and production values for iron ore in overall Swedish production, 2000-2018

Notes: Price and production are normalized to 2004 values (2004=100). Data are obtained from SGU (2021) and the International Monetary Fund.

The empirical literature affirms that resource endowments and the location of mines are exogenous because they occur due to chance, the local geology, and natural characteristics rather than to the political and economic environment in the host country. Therefore, these are considered good measures of exogenous variation in resource wealth (Brunnschweiler and Bulte, 2008; Van der Ploeg and Poelhekke, 2010). To quantify the exposure to mining (treatment intensity), we construct a measure of the distance in kilometers from the individual's residential location to the nearest mine, depending on the coordinates of the grid where she/he is located. The grids in the data are 250 by 250 meters in size in urban areas and 1000 by 1000 meters in size in rural areas. Individuals are located in these grids according to their place of residence. Using distance, we create a categorical treatment indicator, which categorizes individuals into different treatment groups (rings) depending on how close they are to the mines. The location nearest to the mine is also known in the literature as the "direct vicinity" of the mine (Von der Goltz and Barnwal, 2019), whereas those individuals located farther away (less treated) are located in the comparison group, which is known as the "general vicinity" of the mine.

The approach of defining exposure to mining as being geographically close to a mine is commonly used in the literature and is also known as the "ring method" (Wilson, 2012; Aragón and Rud, 2016; Kotsadam and Tolonen, 2016; Von der Goltz and Barnwal, 2019; Benshaul-Tolonen et al., 2019; Bazillier and Girard, 2020; Butts, 2023). Ring estimates compare average changes in outcomes between the inner treated ring and the outer control ring. Different studies use different bounds to define treatment depending on the outcome of interest. For example, Von der Goltz and Barnwal (2019) analyze the local wealth and health effects of mineral mining and define exposure to mining as being geographically close to a mine (within 5 km of the nearest mine); their control group is defined as being located within 5-20 km of the nearest mine. Wilson (2012) define treatment at a cutoff of 10 km. Both of these studies performed sensitivity analysis based on their choices.

An important decision in the abovementioned method is the choice of distance cutoffs to construct the treatment intensity. According to Butts (2023), the wrong choice of cutoff biases the results, while the correct identification of the cutoff enables an enhanced understanding of the spatial propagation of the treatment effects. Therefore, Butts (2023) proposes an alternative nonparametric estimator that allows us to obtain a more complete picture of how the shock affects units at various distances rather than estimating an "overall effect", giving an initial idea of the spatial propagation of the shock.[3] The main advantage of this method is that it estimates a curve that represents the effect as a function of distance by using many rings. In addition, the nonparametric estimator selects the rings in a data-driven procedure, removing the idea of selecting a specific cutoff where the treatment effects become zero to estimate an average treatment effect (Cattaneo et al., 2019, 2020; Butts, 2023), avoiding possible specification searching (Andrews and Kasy, 2019), and placing approximately the same number of individuals in each ring. A limitation of the method in our case is that we lose the time dimension of the data, forcing us to compare the average values of the outcome before and after the shock. Therefore, we use this method as a first approximation of the spatial propagation of the effect of the shock and define the rings that we use in the estimation framework. Figure 2 shows the results of this method for changes in average pre- (2000-2003) and postboom (2004-2015) yearly earnings for individuals located at a maximum of 500 km from the nearest mine.[4] As seen, there is an increase in earnings for individuals located closer to the mines and a significant spatial diffusion of the effects of the boom that spread to approximately 150 km.

[3]According to Butts (2023), this method is similar to using the distance to the nearest mine as a continuous measure to estimate the "dosage-response" function proposed by Callaway et al. (2024) in the difference-in-differences approach with continuous treatment.

[4]The postboom period may be too large; for robustness checks, we reestimate the results to reduce the postboom period to, first, only three years after the shock (2004-2007) and second, the boom period (2004-2011). The results, which are available upon request to the authors, are robust to these modifications.

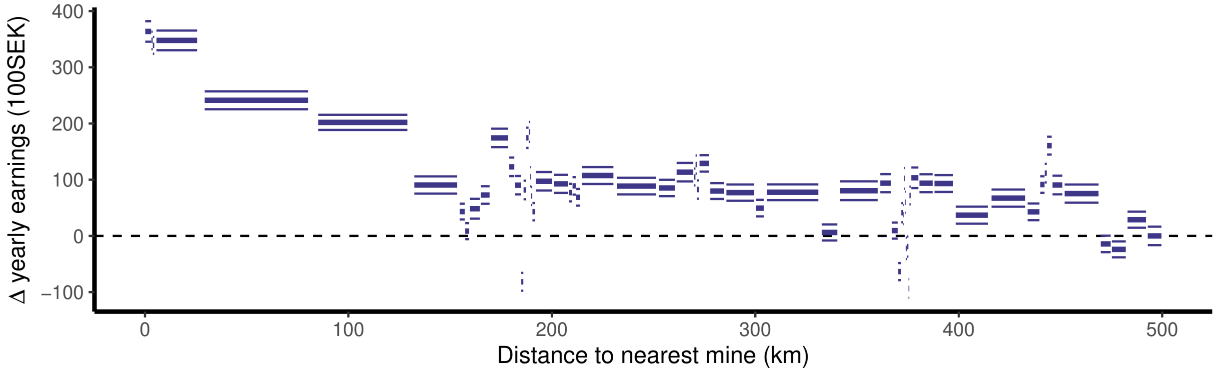


Figure 2: Nonparametric estimation of average yearly earnings change, 2000-2003 vs 2004-2015

Notes: Yearly earnings (in 100 SEK) are deflated to 2000 values using the national CPI. Yearly earnings are analyzed in 100 Swedish krona values (in 100 SEK). We use the distance from each individual to the nearest mine in kilometers.

We use these results (Figure 2) to define the outer ring in the empirical analysis and the different inner rings. We limit the analysis to those individuals located at a maximum distance of 150 km from the nearest mine to avoid including people located in large cities and make sure to compare similar observations.[5] This is a common approach found in the empirical literature. For example, Benshaul-Tolonen et al. (2019) limits the data to include households within 100 km of a mine location. For the inner rings, we use those defined by the previous method in a data-driven approach, ensuring approximately the same number of individuals in each ring (Butts, 2023). Ring 1 extends from 0 km to 3.16 km, ring 2 extends from 3.17 km to 3.82 km, ring 3 extends from 3.83 km to 4.61 km, ring 4 extends from 4.62 km to 26.68 km, ring 5 extends from 26.69 km to 82.84 km, ring 6 extends from 82.85 km to 131.33 km, and ring 7 extends from 131.34 km to 150.00 km.[6] These rings are used in the analyses to evaluate the spatial and temporal diffusion of the shock. While we expect the boom effects to diminish with increased distance from the mines, the specific nature and timing of this distance decay remain unclear.[7]

Figure 3 shows the locations of the mines considered and the four outer rings, i.e., rings

[5]There is a large literature about the urban wage premium, affirming that workers earn higher wages in cities than in rural areas (Yankow, 2006; Gould, 2007; Andersson et al., 2014). The presence of large cities close to 200 km and 400 km explains the high variation in Figure 2 at these specific distances.

[6]As seen in the Online Appendix Figure B.1, the rings are created following the distribution of individuals in the distance to the nearest mine. By using this approach, we model geography, the location of individuals, and economic activity in a continuous space (Arbia, 2001).

[7]As illustrated in Figure 2, the first three rings are small in size, and the overall change in earnings within these rings does not appear to be significantly different from the changes observed in ring 4. Thus, as a robustness check, in Online Appendix Table A.8 column (4), we group the smaller rings (1, 2, and 3) into one ring. Ring A1: 0.00 km-4.61 km, ring A2: 4.62 km-26.68 km, ring A3: 26.69 km-82.84 km, ring A4: 82.85 km-131.33 km, and ring A5: 131.34 km-150.00 km. This change has little effect on the results.

4-7. The first three rings are not depicted on the map because of their relatively small size, as previously described and illustrated in Figure 2. The orange color in Figure 3 indicates dense areas, with the dense areas on the east coast near the border of ring 7 corresponding to the peaks in Figure 2. We consider the three mines that were continuously operating during the mining boom period (2004-2010) and produce mainly iron ore, namely, the Malmberget mine located in Gällivare municipality and the Kirunavaara and Gruvberget mines, both of which are located in Kiruna municipality. While the mine in Gällivare is located in a dense area (grid size 250 m*250 m), the mines in Kiruna are located outside an urban area (grid size 1000 m*1000 m). These are the only iron ore mines in Sweden in the boom period and represent the majority of mining employment (Online Appendix Table A.1). The majority of mining workers in Sweden are concentrated in the northern part of the country, mainly in Norrbotten County. Online Appendix Table A.1 shows some basic information about the mines, the municipalities where they are located, and their employment share in the mining sector.

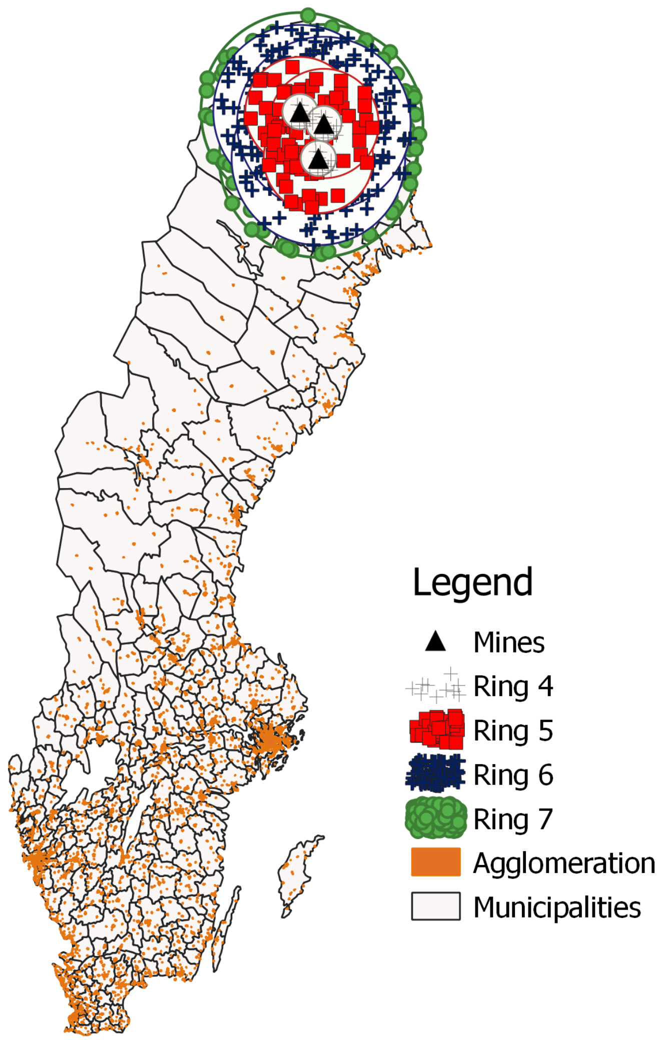


Figure 3: Maps of mines in rings 4-7 and dense areas

Notes: The figure shows a map of the studied mines, the four largest rings (rings 4-7), dense areas/agglomerations (defined as contiguous settlements with at least 200 inhabitants), and Sweden's municipalities.

Table 1 shows summary statistics of all the variables by ring for the estimated sample separated for the preshock and postshock periods. The average labor earnings in the total sample are 142,170 SEK per year in the preshock period and 196,057 SEK per year in the postshock period, and the average distance to the nearest mine is 40.55 km after the shock. Approximately 10 percent of individuals in the full sample are employed in the primary sector before the shock and 13 percent after the shock, whereas 22 percent of individuals located in ring 1 are employed in the primary sector after the shock. Finally, the sample size is similar per ring as a result of the method developed by Butts (2023).

Table 1: Summary statistics, 2000-2003 and 2004-2015

	Ring 1 00-03 Mean SD	Ring 1 04-15 Mean SD	Ring 2 00-03 Mean SD	Ring 2 04-15 Mean SD	Ring 3 00-03 Mean SD	Ring 3 04-15 Mean SD	Ring 4 00-03 Mean SD	Ring 4 04-15 Mean SD	Ring 5 00-03 Mean SD	Ring 5 04-15 Mean SD	Ring 6 00-03 Mean SD	Ring 6 04-15 Mean SD	Ring 7 00-03 Mean SD	Ring 7 04-15 Mean SD	Total 00-03 Mean SD	Total 04-15 Mean SD
Earnings	1563.39	2180.70	1576.85	2155.83	1721.43	2299.35	1525.81	2115.94	1187.65	1670.57	1104.06	1553.87	1231.55	1555.41	1421.70	1960.57
(in 100SEK)	(1247.40)	(1567.37)	(1275.64)	(1534.94)	(1285.23)	(1510.03)	(1273.81)	(1545.01)	(1147.14)	(1423.33)	(1095.36)	(1304.23)	(1131.30)	(1293.11)	(1233.23)	(1497.57)
Employment	0.74	0.81	0.72	0.81	0.78	0.84	0.72	0.80	0.64	0.76	0.62	0.75	0.68	0.75	0.70	0.79
	(0.44)	(0.39)	(0.45)	(0.39)	(0.42)	(0.36)	(0.45)	(0.40)	(0.48)	(0.42)	(0.48)	(0.43)	(0.46)	(0.43)	(0.46)	(0.41)
Distance to	1.97	1.93	3.51	3.51	4.17	4.18	9.14	9.03	59.65	60.24	109.41	109.81	139.52	139.71	42.04	40.55
mine(km)	(0.96)	(1.04)	(0.20)	(0.20)	(0.22)	(0.22)	(6.15)	(6.00)	(17.66)	(17.61)	(13.56)	(13.54)	(6.08)	(6.09)	(50.46)	(50.15)
Married	0.39	0.32	0.40	0.34	0.50	0.43	0.35	0.32	0.42	0.36	0.47	0.41	0.49	0.44	0.43	0.37
	(0.49)	(0.47)	(0.49)	(0.48)	(0.50)	(0.50)	(0.48)	(0.47)	(0.49)	(0.48)	(0.50)	(0.49)	(0.50)	(0.50)	(0.49)	(0.48)
Children	0.37	0.33	0.38	0.35	0.45	0.43	0.33	0.32	0.35	0.31	0.36	0.32	0.37	0.33	0.37	0.34
under 18	(0.48)	(0.47)	(0.48)	(0.48)	(0.50)	(0.49)	(0.47)	(0.47)	(0.48)	(0.46)	(0.48)	(0.47)	(0.48)	(0.47)	(0.48)	(0.47)
Primary educ.	0.62	0.51	0.58	0.47	0.55	0.44	0.63	0.52	0.67	0.56	0.68	0.57	0.68	0.58	0.63	0.52
	(0.48)	(0.50)	(0.49)	(0.50)	(0.50)	(0.50)	(0.48)	(0.50)	(0.47)	(0.50)	(0.47)	(0.50)	(0.46)	(0.49)	(0.48)	(0.50)
Secondary educ.	0.30	0.38	0.33	0.40	0.35	0.41	0.29	0.37	0.26	0.34	0.25	0.34	0.24	0.33	0.29	0.37
	(0.46)	(0.48)	(0.47)	(0.49)	(0.48)	(0.49)	(0.45)	(0.48)	(0.44)	(0.47)	(0.43)	(0.47)	(0.43)	(0.47)	(0.45)	(0.48)
Tertiary educ.	0.08	0.11	0.09	0.13	0.10	0.15	0.08	0.11	0.07	0.10	0.07	0.10	0.08	0.10	0.08	0.12
	(0.27)	(0.32)	(0.29)	(0.34)	(0.31)	(0.35)	(0.27)	(0.31)	(0.25)	(0.30)	(0.25)	(0.30)	(0.27)	(0.30)	(0.27)	(0.32)
Non-employed	0.26	0.19	0.28	0.19	0.22	0.16	0.28	0.20	0.36	0.24	0.38	0.25	0.32	0.25	0.30	0.21
	(0.44)	(0.39)	(0.45)	(0.39)	(0.42)	(0.36)	(0.45)	(0.40)	(0.48)	(0.42)	(0.48)	(0.43)	(0.46)	(0.43)	(0.46)	(0.41)
Primary sec.	0.18	0.22	0.11	0.14	0.12	0.15	0.11	0.15	0.06	0.10	0.05	0.08	0.04	0.06	0.10	0.13
	(0.38)	(0.42)	(0.31)	(0.34)	(0.32)	(0.36)	(0.31)	(0.35)	(0.24)	(0.30)	(0.21)	(0.27)	(0.21)	(0.23)	(0.30)	(0.34)
Secondary sec.	0.09	0.11	0.09	0.11	0.10	0.11	0.11	0.14	0.12	0.15	0.13	0.16	0.15	0.15	0.11	0.13
	(0.28)	(0.31)	(0.29)	(0.31)	(0.30)	(0.31)	(0.31)	(0.34)	(0.33)	(0.35)	(0.34)	(0.36)	(0.35)	(0.36)	(0.31)	(0.33)
Tertiary sec.	0.48	0.48	0.53	0.57	0.56	0.58	0.50	0.52	0.45	0.52	0.45	0.51	0.49	0.54	0.49	0.53
	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)	(0.49)	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)
Nxt	21991	61281	22174	66794	21632	65526	20828	64266	22848	62817	23225	62721	13060	37002	145758	420407
N	5498	5107	5544	5566	5408	5460	5207	5356	5712	5235	5806	5227	3265	3084	36440	35034

Notes: Yearly earnings (in 100 SEK) are deflated to 2000 values via the national CPI. Yearly earnings are analyzed in 100 Swedish krona values (in 100 SEK). Ring 1: 0.00 km-3.16 km, ring 2: 3.17 km-3.82 km, ring 3: 3.83 km-4.61 km, ring 4: 4.62 km-26.68 km, ring 5: 26.69 km-82.84 km, ring 6: 82.85 km-131.33 km, and ring 7: 131.34 km-150.00 km. Marital status is a dummy variable equal to 1 if the individual is married and 0 otherwise. The educational level is divided into primary, secondary, and tertiary levels. The economic sector is divided into primary, secondary, and tertiary sectors. The primary sector includes the extraction and agricultural sector; the secondary sector includes manufacturing and construction; and the tertiary sector includes services, healthcare, the public sector, and others.

2.3 Empirical framework

The exogeneity of the location of mines and the exogeneity of the mining boom are used to estimate the causal effect of the shock. The exposure measures are taken as exogenous since they depend mainly on the geology of local communities (location of mines) (Christian and Barrett, 2024). Moreover, to ensure the exogeneity of these measures, we interact them in the estimations with the intensity measures of the shock (the years that represent the time evolution of international iron ore prices). Therefore, we exploit two sources of variation, namely, temporal (the global mining price shock) and spatial (individuals' distance to mines providing a source of heterogeneous exposure). The identification relies on the interaction term of shock exposure and shock intensity. Therefore, the strategy follows the same logic as a difference-in-differences (DID) approach, as Nunn and Qian (2014) and Pelzl and Poelhekke (2021). The idea is that mining international prices are the main drivers of the benefits or costs of mining activities since they directly determine the expected gains of miners, mining companies, and labor market-related activities (Bazillier and Girard, 2020).

We estimate the following dynamic DID specification (also known as event study models)[8]:

$$Y_{ijt} = \alpha_i + \alpha_j + \alpha_t + \sum_{t}^{T} \beta_{jt} \times I_t \times Ring(d)_{ijt} + \lambda X_{it} + \epsilon_{ijt} \tag{1}$$

where the variable Y_{ijt} corresponds to the different outcomes (earnings or employment) for each individual i located in grid j in year t. α_i, α_j, and α_t are individual, grid, and time fixed effects, respectively, which are included to control for confounding omitted variables that vary at the unit or time level. Using this two-way fixed events approach helps to isolate the effect of the event (Miller, 2023). X_{it} is a vector of time-varying individual characteristics as controls for other underlying factors that may influence the outcome variable (marital status, having children under 18 years old, education level, and economic sector).[9] $Ring(d)_{ijt}$ is the exposure measure to the shock, measured as a set of indicators equal to 1 if individual i located in grid j belongs in the following distance bins (in kilometers) from the nearest mine: $d \in \{(0.00, 3.16]$, $(3.16, 3.82]$, $(3.82, 4.61]$, $(4.61, 26.68]$, $(26.68, 82.84]$, $(82.84, 131.33]$, $(131.33, 150.00]\}$. The I_ts

[8] Miller (2023) provides a detailed introductory description of event study models, and Freyaldenhoven et al. (2021) describes assumptions regarding visualization, identification, and estimation of linear panel event-study designs.

[9] We control for marital status, having children under 18 years old, education level, and economic sector because they may affect the earnings of individuals. However, we recognize that some of the controls could be endogenous to the mining boom (Allcott and Keniston, 2018; Pérez and Rodríguez-Puello, 2022). Therefore, we estimate the main results with and without controls (Online Appendix Table A.3), and the results are similar. Marital status is a dummy variable equal to 1 if the individual is married and 0 otherwise. The educational level is divided into primary, secondary, and tertiary levels. The economic sector is divided into non-employed, primary, secondary, and tertiary sectors. The primary sector includes the extraction and agricultural sector; the secondary sector includes manufacturing and construction; and the tertiary sector includes services, healthcare, the public sector, and others.

are indicators for each period to provide event study plots or a binary indicator equal to 1 after 2004.[10] As is common in the empirical literature, when we examine employment (binary outcome), we use a linear probability model with grid and year fixed effects (Huntington-Klein, 2021). We cluster standard errors at the grid level, allowing for an arbitrary covariance structure over time within each grid, and account for the serial correlation in the error term (Bertrand et al., 2004; Miller, 2023).

The β_{jt}'s identify the per-period difference-in-differences estimate of the effects of the resource shock on the outcome Y. The first difference is between the reference period $t = 2003$ and the period $t + x$. The second difference is between the treated and control individuals. We normalize $\beta_{j,2003}$ to zero; thus, all the coefficients can be interpreted as changes relative to that year, i.e., the last pretreatment period. These coefficients identify the differential local impact of the economic shock on the individual's outcomes of interest and allow us to analyze the time propagation of the shock. The coefficients after the event has occurred (β_{jt} for $t > 2003$) capture the dynamic effects of the treatment, as these effects manifest over time since the event. The coefficients before the event has occurred (β_{jt} for $t \leq 2003$) provide a placebo or falsification test. The main outcome variable is yearly earnings (in 100 SEK). We adjust all monetary variables to real values with the base year 2000 using the national CPI. To avoid typical problems of zeros in the outcome variables (Chen and Roth, 2024; Mullahy and Norton, 2024), we measure earnings in levels. Therefore, the coefficients can be interpreted as the effect on earnings as measured directly in 100 Swedish krona (in 100 SEK).

We complement the previous analysis by analyzing the diffusion effects of the shock, with a focus on specific population groups, as the effect may vary significantly according to different individual and economic characteristics. This analysis contributes evidence concerning what specific groups obtain benefits from mining booms. In the case of heterogeneity analyses by educational level, gender, and age, we follow the same method explained previously (ring method). In the case of sectoral diffusion of the effects of these economic shocks, we divide the analysis into direct effects in the mining sector and spillover effects into the remaining economy. Specifically, it is useful to assess what type of jobs or economic sectors receive increases in earnings (Rajbhandari et al., 2022) and whether the effects are limited to sectors that are directly employed in mining extraction or whether these effects (positive or negative) are experienced in other sectors as well (Feyrer et al., 2017). To analyze the direct effect of the mining boom on the mining sector, we are not able to use the ring method because the number of mining workers in rings 6 and 7 is low. Therefore, in this case, we use the temporal variation (the global mining price shock) interacted with a dummy variable equal to one if the worker is employed in the mining sector (treatment) and zero for the remaining workers (control), following the same idea as the dynamic DID approach. This specification allows us

[10] In some estimations, owing to space limitations, the I_ts are replaced for a variable named post, which is a binary indicator equal to 1 after 2004, via the restricted two-way fixed effects difference-in-differences (DID) approach.

to analyze the diffusion of the resource shock across economic sectors (Moretti, 2011; Aragón and Rud, 2013). We estimate the following specification:

$$Y_{ijt} = \alpha_i + \alpha_j + \alpha_t + \sum_{t}^{T} \beta_{jt} \times I_t \times Mining_{ijt} + \lambda X_{it} + \epsilon_{ijt} \tag{2}$$

where the variable Y_{ijt} corresponds to the different outcomes for each individual i located in grid j in year t. It includes the same fixed effects as before (α_i, α_j, and α_t), and the same time-varying controls (X_{it}). $Mining_{ijt}$ is the exposure measure to the shock, which is equal to 1 if individual i located in grid j in year t is employed in the mining sector. The I_ts are indicators for each period to provide event study plots. We cluster standard errors at the grid level. We drop nonemployed worker-year observations from the dataset prior to this estimation to compare workers in the mining sector to other workers. To analyze the spillover effects into other economic sectors, we follow the ring method (equation (1)) and classify economic sectors into agricultural, manufacturing, construction, services, public, and other sectors (including healthcare).

2.4 Identification

The coefficients of interest (β_{jt}s) offer a causal interpretation if we fulfill four key identification assumptions. First, the individuals located in the different treated groups (rings) followed the same economic trajectory before the boom. In other words, we find no different time trends present between treated and control individuals before the shock. According to Butts (2021), when the ring method is used, an important assumption is that each ring follows a parallel trend with "faraway" less-treated units. If this assumption is not fulfilled, then we can observe effects resulting from preexisting trends instead of the boom. As a first approximation to test this assumption visually, we present unconditional results from the design (Online Appendix Figure B.2), showing the temporal dynamics of the raw average of the outcome variable separately for each group of treated individuals (rings) before and after the shock. In this figure, we expect that if the shock affected the outcome of interest, then the outcome trends would diverge after the beginning of the shock in 2004. As seen, there are no systematic differences in the preboom time trends across different groups, thereby supporting the "parallel trends" assumption required for causal identification in DID (Meyer, 1995). Nevertheless, this conclusion is only visual. To test the parallel trends properly, we use Equation (1), which allows us to statistically test this assumption by assessing whether the outcomes of treated and comparison individuals, on average, are parallel before the shock, using treatment leads and lags in the estimation (Cunningham, 2021). With these results, we expect the estimated coefficients for each period before the shock to be not significantly different from 0, as shown in Figure 4.

The second assumption is that there are no time-varying relevant omitted variables at the treatment level correlated with the shock intensity and the outcomes. In our case, the approach assumes that individuals located very close to each other are similar because we restrict control locations to those within the general vicinity of mines (Von der Goltz and Barnwal, 2019). Online Appendix Table A.2 shows the changes in individual characteristics between 2000 and 2003 for each examined ring compared with those in ring 7 (reference group) and the mean difference test. We do not find any economically meaningful differences in trends across rings, and only a few characteristics have p-values less than 0.05. The inclusion of individual fixed effects absorbs time-invariant individual characteristics. Third, a concern is that individuals may have endogenously self-selected into locations close to the mines because they expected that the movement would improve their living conditions and future earnings. We address this concern in a robustness check by estimating the main effects via individual location and distance to the nearest mine in the year 2003 (preboom), and the results are robust. In addition, we address the concern of endogenous migration to the mining area because of the shock by performing a separate analysis of preexisting residents removing the migrants in these mining areas from the sample (Benshaul-Tolonen et al., 2019; Jacobsen et al., 2023). The results for residents are important for local policymakers, who are focused on policies that improve welfare conditions in local communities. Finally, when defining treatment via spatial location or geographical boundaries, there may be spillover effects that crossover borders and bias the DID results because nearby "control" units are contaminated by the shock and fail to estimate counterfactual trends (Kolak and Anselin, 2020; Vazquez-Bare, 2023). While the mining boom can be considered a macroeconomic shock, potentially affecting the whole country, we are interested in local effects, assuming our comparison group is the least treated. By using a set of distance bins from the treated units (mines) and interacting them with a treatment indicator, we remove the bias from the treatment effect without making any additional assumptions (Butts, 2021). An important benefit of this estimator is that the indicators estimate the average spillover effect in treated/control individuals within that ring, thus providing a more complete picture of the units affected by the shock and the magnitude.

3 Results

We divide this section into two parts to analyze the overall diffusion of the economic shock. First, we analyze the spatial diffusion of the effect of the mining boom on earnings. Second, we evaluate *who* is affected by examining the diffusion of the impacts of the shock across different economic sectors and demographic groups. Finally, robustness checks for the main results are performed.

3.1 Spatial diffusion: earnings

Figure 4 shows the dynamic treatment effect computed via specification (1) and 95% confidence intervals, which show the temporal and spatial diffusion of the effect of the mining boom on yearly earnings (in 100 SEK) by year for the 2000-2015 period and each of the rings. Ring 7 and the year 2003 are used as references. This estimation is for the full sample, showing the overall effect of the economic shock on the local population. The coefficient estimates, standard errors, and sample descriptives corresponding to the figure are reported in the Online Appendix Table A.4. We include marital status, having children under 18 years old, educational levels, and economic sectors as controls, as well as individual, grid, and time fixed effects.[11] Standard errors are clustered at the grid level.

The coefficients identify the differential local dynamic impact of the economic shock on individuals close to the mine compared with those farther away. The coefficients before the shock allow us to test the presence of parallel pretrends. As seen, most of these coefficients are not significantly different from zero, providing evidence supporting the identifying assumption that the individuals located in the different treated groups followed the same economic trajectory before the boom. Individuals located in rings 1, 2, 3, and 4 experience significant positive effects of the mining boom on earnings. For example, for those individuals located very close to the mines (ring 1), we observe an average increase of 8,377 SEK yearly earnings the first year after the shock (2004), compared with those in ring 7 (see Online Appendix Table A.4). This effect represents a 5.22% increase from the average earnings in ring 1 in the year 2003 (160,566 SEK). These positive effects increase with time. In 2011, for example, the average increase in yearly earnings in ring 1 is 41,581 SEK, compared with that in ring 7 in 2003, representing a 25.90% increase from the average earnings in ring 1 in the year 2003. These findings provide evidence of a long-lasting effect of the mining boom that appears to be unaffected by the bust. With respect to the spatial diffusion of the economic shock, individuals located in ring 5 experience a significant positive but weaker effect. In contrast, those individuals located in ring 6 do not experience the same positive effect of the mining boom, suggesting that the mining boom affects individuals located as far as 83 km from the mine. Importantly, these results are relative to ring 7, which is treated to a lesser extent.

[11] Online Appendix Table A.3 shows the estimation results with and without controls because some of these variables could be endogenous to the mining boom (Allcott and Keniston, 2018; Pérez and Rodríguez-Puello, 2022). While removing controls from the main specification has little effect on the sign of the coefficient estimates, the magnitude is slightly reduced.

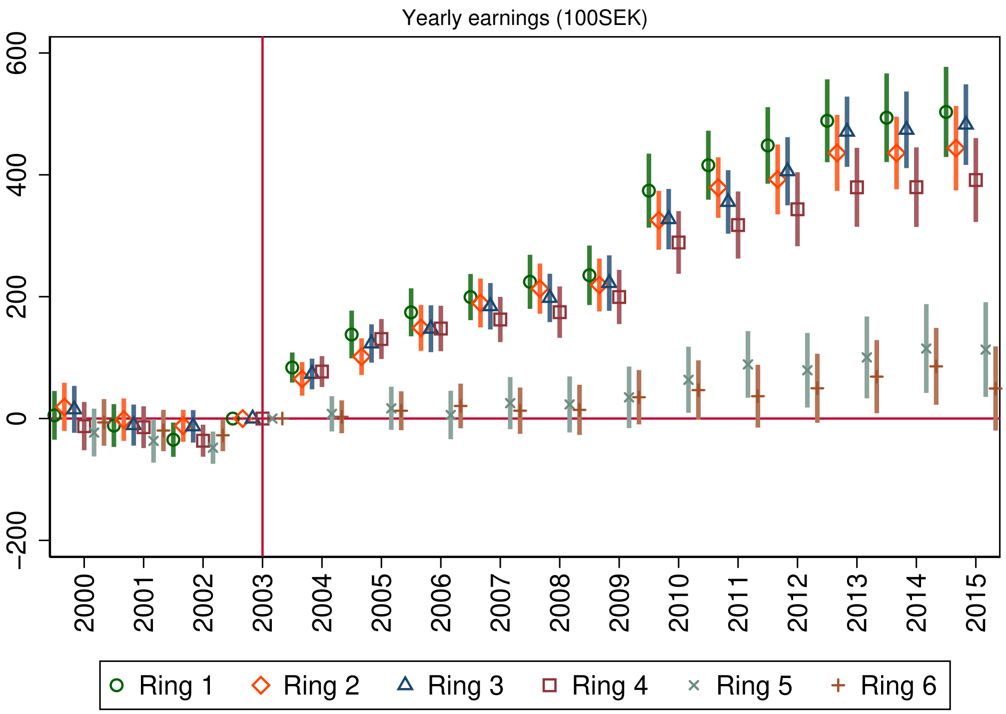


Figure 4: Event study of the impact of the mining boom on yearly earnings (in 100 SEK), 2000-2015

Notes: Yearly earnings (in 100 SEK) are deflated to 2000 values using the national CPI. Yearly earnings are analyzed in 100 Swedish krona values (in 100 SEK). Ring 1: 0.00 km-3.16 km, ring 2: 3.17 km-3.82 km, ring 3: 3.83 km-4.61 km, ring 4: 4.62 km-26.68 km, ring 5: 26.69 km-82.84 km, ring 6: 82.85 km-131.33 km, and ring 7: 131.34 km-150.00 km. Ring 7 and year 2003 are the references. 95% confidence interval shown. Estimation includes marital status, having children under 18 years old, educational levels, and economic sectors as controls, as well as individual, grid, and time fixed effects. Standard errors are clustered at the grid level.

These results may be a combination of the effects of the economic shock on earnings and endogenous movement decisions made by individuals who migrated to the mining areas (Winters et al., 2021) or individuals who moved between rings (closer to the mines) because of the boom. We address these concerns in two ways. First, we limit the movement of individuals between rings by classifying individuals in the rings using the distance to the nearest mine in the year 2003 (preboom). This approach allows us to avoid not only simultaneous causality problems in the estimates but also conditioning the explanatory variation on postboom information; this is because individuals may decide to move between rings because of the boom, which also limits the data to individuals who were in the records in 2003 (last year in the pretreatment period) and located within 150km from one of the mines. Online Appendix Figure B.3a shows these results, which are similar to the previous results even when accounting for endogenous movement between rings. Second, we limit the movement of individuals who migrated to mining areas by dropping migrants from the analysis and focusing specifically on residents while allowing them to move between rings (Online Appendix Figure B.3b).[12] The results are similar to those of the baseline model with the full sample. The main reason is the low number of migrants in the sample compared with the number of residents. These results provide evidence that resource booms substantially increase local economic activity and average earnings of residents, despite substantial population migration (Black et al., 2005a; Allcott and Keniston, 2018).[13]

Overall, these results align with those of previous studies suggesting that economic shocks in the form of mining booms improve the labor market conditions of treated individuals (Black et al., 2005a; Aragón and Rud, 2013; Benshaul-Tolonen et al., 2019). For example, Chávez and Rodríguez-Puello (2022) analyzes the effects of the mining boom on the average municipal wages of mining municipalities in Chile, finding evidence of an increase in wages for individuals in treated areas. Nevertheless, most of the literature focuses on the short-term effects of resource booms and analyzes large geographical entities. Our results provide evidence of long-lasting effects of the mining boom in Sweden that are higher during the bust period, which is in contrast to the findings of previous studies suggesting that the benefits of booms are usually lower than the losses from busts (Michaels, 2011; Jacobsen and Parker, 2016; Jacobsen et al., 2023). The results are in line with those of Kovalenko (2023), who find that the earnings gains from the fracking boom in the US are relatively persistent over time. Finally, our results regarding the economic propagation of the shock across space are in line with those of previous studies (Feyrer et al., 2017; Allcott and Keniston, 2018; Diemer, 2024). For example, Allcott and Keniston (2018) affirm that oil and gas endowments in the U.S. affect earnings up to 150 miles ($\sim$ 241 km) from the resource site. In the Swedish case, we find significantly less propagation (up to 83 km), which can be due to the location of the mines in the northern part of the country, a geographic area characterized by being a peripheral area with low population density and population decline. This result is in line with that of Feyrer et al. (2017), who report significant economic propagation of the effects of the fracking revolution in the U.S. on income and employment; however, most of the effects still

[12] We consider migrants individuals who migrated to a distance of 150 km or less from the nearest mine in either 2004 or after. We assume that those individuals who migrated to this area of the country in either 2004 or after did so because of the better labor market conditions due to the economic shock. In the sample, there are a total of approximately 135,396 migrants*year observations or 8,462 migrants.

[13] The main earning results include both employed and nonemployed individuals; therefore, they may represent the combined effect of the mining boom on earnings and employment. To disentangle these effects, we limit the sample to individuals employed in a given year (Online Appendix Figure B.3c). The results are similar to the results found when the full sample is used. Workers located in rings 1, 2, 3, 4, and 5 experience significant positive effects of the mining boom on earnings. As additional analyses, we change the outcome in the estimations for different types of income. Online Appendix Figure B.4 shows the results for yearly disposable income (in 100 SEK) and yearly income from business activities (in 100 SEK). While the magnitude of these estimates is attenuated in the first years after the shock, the precision, pattern of effects, and sign are very similar to the results of yearly earnings.

occur within 100 miles ($\sim$ 160 km) of the drilling sites.

3.2 Who is affected?

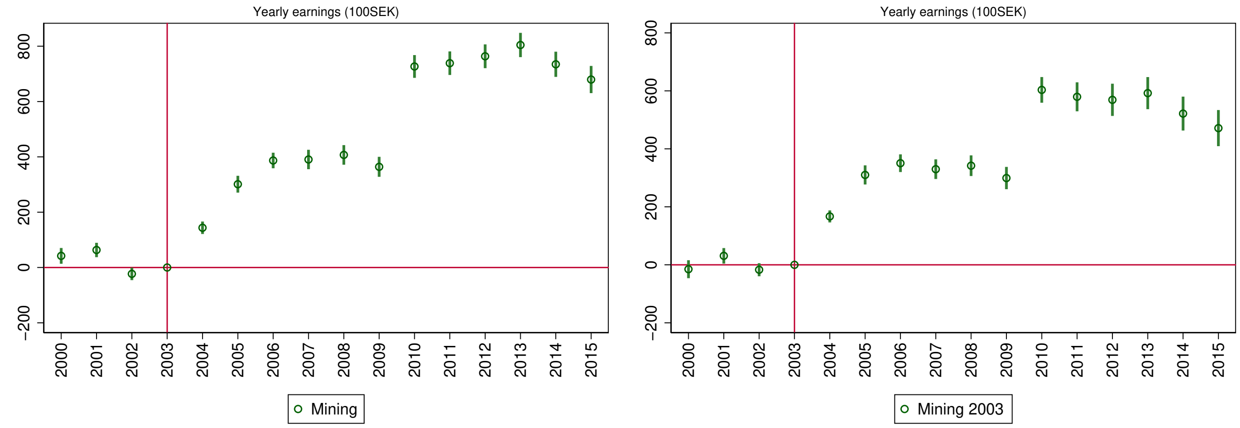
This subsection focuses on *who* is affected by the economic shock by examining the diffusion of the impacts of the shock across different economic sectors and population groups. Therefore, it is divided into the following parts. First, we examine how the impacts of the shock vary across different economic sectors, starting with the direct effect on mining workers. Second, we focus on heterogeneity analysis by demographic characteristics.

3.2.1 Economic sector

Figure 5 shows the dynamic treatment effect computed via specification (2) and 95% confidence intervals, which reveals the direct effect of the mining boom. Specifically, the effects of the economic shock on yearly earnings (in 100 SEK) by year for the 2000-2015 period for workers in the mining sector are compared with those for workers in the other sectors. The year 2003 is used as the reference. Nonemployed individuals and migrants are excluded from the sample. Figure 5a allows individuals to move between sectors, whereas Figure 5b limits the movement of individuals between sectors by using the sector in the year 2003 (preboom). The coefficient estimates, standard errors, and sample descriptives corresponding to the figures are reported in the Online Appendix Table A.5.

The coefficients identify the differential local dynamic impact of the economic shock on mining workers compared with workers in other sectors. Intuitively, international prices of mining are the main drivers of the benefits or costs of mining activities, determining the expected gains of miners, mining companies, and labor market-related activities (Bazillier and Girard, 2020). Therefore, we expect a large positive direct effect of the mining boom on mining workers. As seen, mining workers experience a significant positive direct effect of the mining boom on earnings. For example, they observed an average increase of 14,370 SEK yearly earnings the first year after the shock (2004) compared with workers in other sectors (see Online Appendix Table A.5). In 2011 (the peak year of the boom), the average increase in yearly earnings was 73,866 SEK.[14] Therefore, the positive effects are shown to increase with time up to 2013, providing evidence of a long-lasting effect of the mining boom. However, relative to other sectors, the results suggest a small decline in earnings in the mining sector during the last years of the bust phase.

[14] We observe a sharp increase in the effect of the mining boom on mining workers after 2009, i.e., after the global financial crisis. Evidence shows that mineral production in Sweden has recovered from the financial crisis of 2008-2009; in fact, it has almost doubled since then (SGU, 2021). In addition, exploration activities and investment in the sector peaked in 2008 and 2011, with more than 750 million SEK being invested each year, especially in Norrbotten and Västerbotten counties (Tano et al., 2016). Finally, iron ore prices responded after the financial crisis, with a large increase due to demand from BRIC countries (Christian, 2009). Our estimates can help understand how mining moderated the impact of the global financial crisis in the local community.



(a) Mining sector each year

(b) Mining sector in 2003

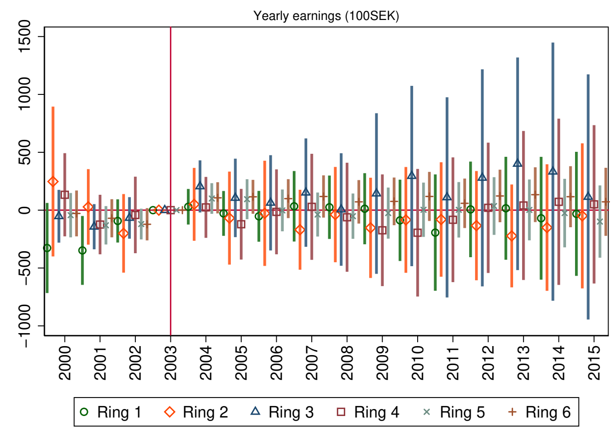
Figure 5: Event study of the impact of the mining boom on yearly earnings (in 100 SEK) for workers in the mining sector, 2000-2015

Notes: Yearly earnings (in 100 SEK) are deflated to 2000 values using the national CPI. Yearly earnings are analyzed in 100 Swedish krona values (in 100 SEK). Nonemployed individuals are excluded from the sample. Workers in all other sectors and the year 2003 are the reference groups. 95% confidence interval shown. Estimation includes marital status, having children under 18 years old, and educational levels as controls, as well as individual, grid, and time fixed effects. Standard errors are clustered at the grid level.

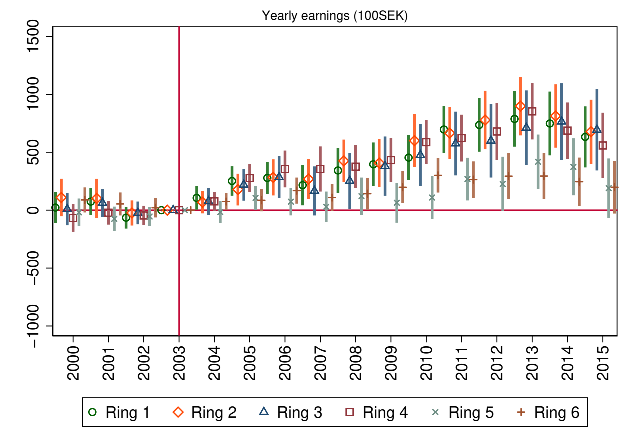
What happens with the remaining workers in the economy? In Figure 6, we analyze the sectoral diffusion or the spillover effects of the mining boom into other sectors of the economy. We follow the ring method (Equation (1)) and classify economic sectors into agricultural, manufacturing, construction, services, public, and other sectors (including healthcare). The figure shows the dynamic treatment effect and 95% confidence intervals, highlighting the effect of the mining boom on yearly earnings (in 100 SEK) by year for the 2000-2015 period and each of the rings and economic sectors. Ring 7 and the year 2003 are used as references. Nonemployed individuals and migrants are excluded from the sample, and individuals are allowed to move between rings. The coefficient estimates, standard errors, and sample descriptives corresponding to the figure are reported in the Online Appendix Table A.4. There are significant spillover effects on other sectors. Workers in the manufacturing, construction, and service sectors experience a significant increase in earnings because of the mining boom. On the other hand, workers in the agricultural, public, and other sectors are not affected. These results align with previous studies that find evidence of positive local spillover effects from resource development, especially oil and gas, into incomes in other industries (Tano et al., 2016; Feyrer et al., 2017; Allcott and Keniston, 2018).[15]

[15]To further compare the effect of the mining boom in different economic sectors, Online Appendix Figure B.5 descriptively shows the dynamic evolution of yearly earnings (in 100 SEK) by economic sector compared with nonemployed individuals. This figure confirms the previous results that the direct effects are large for

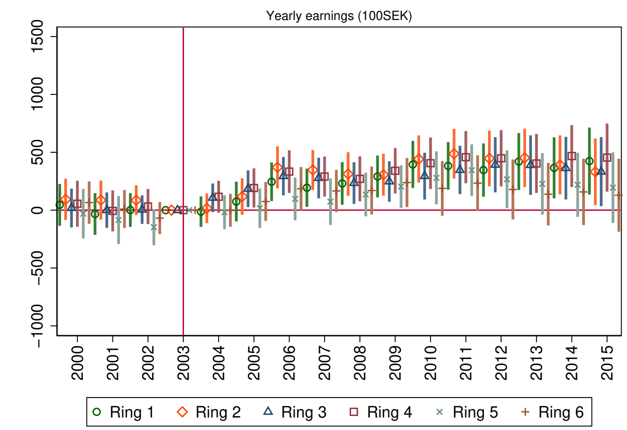
mining workers and that there are significant spillover effects into other sectors.



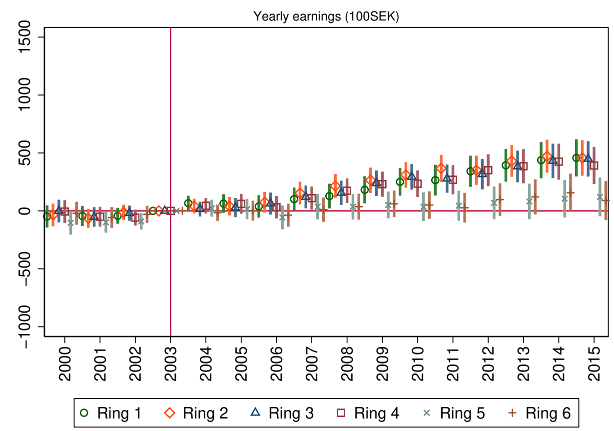
(a) Agricultural sector



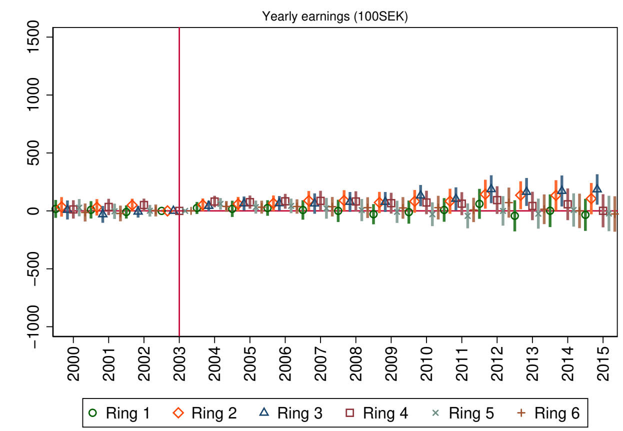
(b) Manufacturing sector



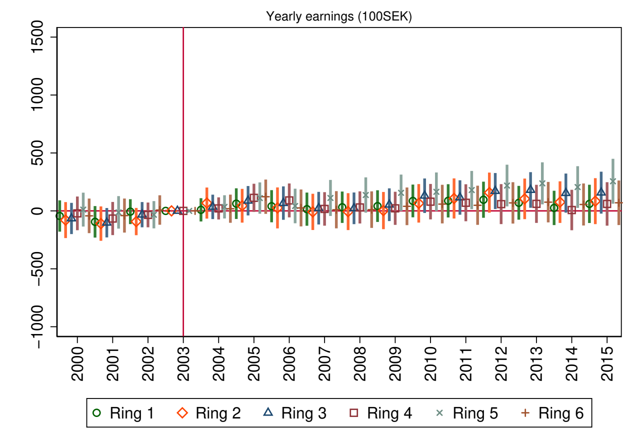
(c) Construction sector



(d) Service sector



(e) Public sector



(f) Other sector

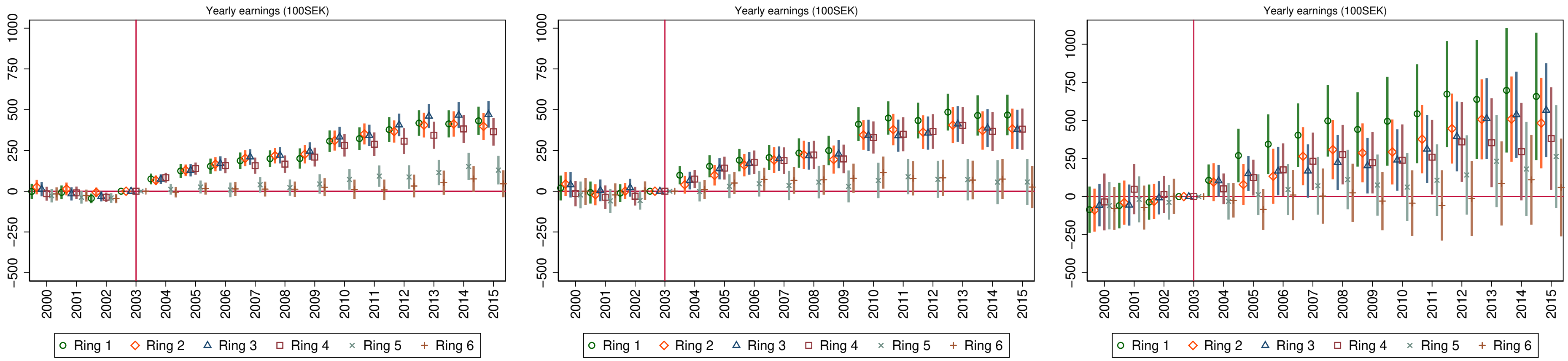
Figure 6: Event study of the impact of the mining boom on yearly earnings (in 100 SEK) by economic sector, 2000-2015

Notes: Yearly earnings (in 100 SEK) are deflated to 2000 values using the national CPI. Yearly earnings are analyzed in 100 Swedish krona values (in 100 SEK). Ring 1: 0.00 km-3.16 km, ring 2: 3.17 km-3.82 km, ring 3: 3.83 km-4.61 km, ring 4: 4.62 km-26.68 km, ring 5: 26.69 km-82.84 km, ring 6: 82.85 km-131.33 km, and ring 7: 131.34 km-150.00 km. Ring 7 and year 2003 are the reference groups. Nonemployed individuals are excluded from the sample. 95% confidence interval shown. Estimation includes marital status, having children under 18 years old, and educational levels as controls, as well as individual, grid, and time fixed effects. Standard errors are clustered at the grid level.

3.2.2 Demographic characteristics

Next, we perform heterogeneity analysis by educational level, gender, and age, using yearly earnings (in 100 SEK) as the outcome and the sample of residents (coefficient estimates, standard errors, and sample descriptives corresponding with the figure are reported in the Online Appendix Table A.6). This approach helps to understand whether the effect of the shock is stronger or concentrated in specific population groups with specific characteristics. Figure 7 shows the heterogeneous effect of the mining boom for primary, secondary, and tertiary educational levels. The gains in earnings as a result of the mining boom are distributed among all educational levels. This result is contrary to what is observed in the literature for developing countries. For example, Pellandra (2015) estimates the impact of a mining boom on the labor market in Chile, differentiating by educational level, and finds that most of the effects are for less educated workers. The main reason for this result is that employment in the Chilean mining sector is composed primarily of low- or medium-low-skilled workers (Rehner and Vergara, 2014; Pérez and Rodríguez-Puello, 2022). Nevertheless, in Sweden, employment in the mining sector is composed of more medium- and high-skilled workers and is more capital-intensive. The results are related to those of Katovich et al. (2023), who analyze the labor market winners and losers of resource boom and bust cycles in Brazil and find that only highly educated workers benefit from booms in terms of earnings and employment, whereas low-educated workers suffer earnings and employment penalties.

In addition, the Online Appendix Figures B.6 and B.7 show the heterogeneity analyses by gender and age. Figure B.6 shows that both males and females experience positive effects from the shock; however, this effect is significantly greater for males than for females. These differentiated effects are in line with previous literature (Chávez and Rodríguez-Puello, 2022; Aguilar-Gomez and Benshaul-Tolonen, 2023) and are expected because the mining sector is dominated mainly by males and the extractive activity labor force is predominantly masculine (Reeson et al., 2012; Chávez and Rodríguez-Puello, 2022). Figure B.7 shows the heterogeneous effect of the mining boom for three age groups, namely, 18-30, 31-50, and 51-65 years. This analysis is important for two reasons. First, younger individuals are expected to be the least educated group in the labor force and thus the most vulnerable to the shock (Pérez and Rodríguez-Puello, 2022). Second, individuals under 50 years of age are considered to be in their prime working age, and by analyzing the specific effect on these individuals, we ensure that the estimated effects come from exogenous variation in the labor markets and not from endogenous decisions about whether to remain in the workforce or retire (Jacobsen et al., 2023). The positive effects of the mining boom on earnings are driven by gains among individuals aged 18-30 years and 31-50 years. Older individuals experience a low but significant gain in earnings.



(a) Primary education

(b) Secondary education

(c) Tertiary education

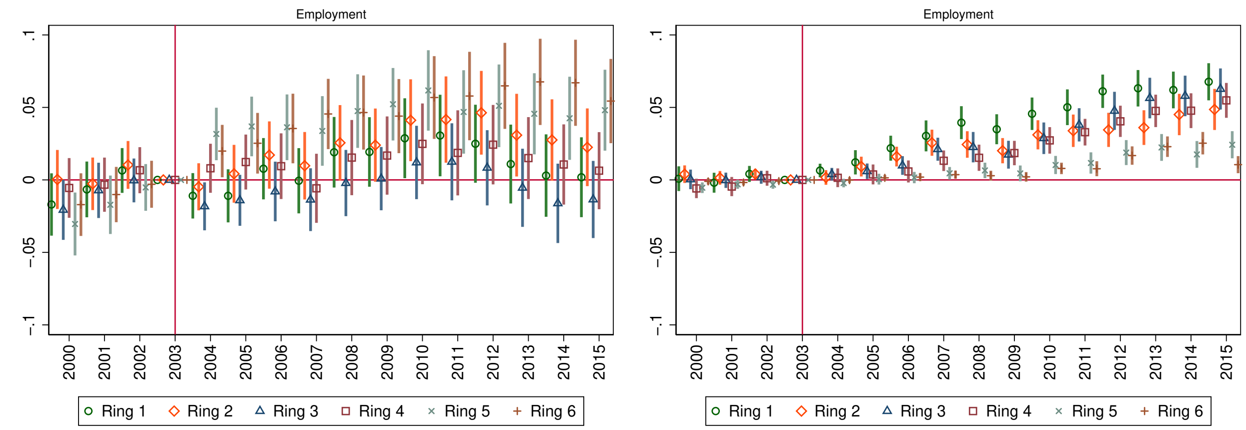
Figure 7: Event study of the impact of the mining boom on yearly earnings (in 100 SEK) by educational level, 2000-2015

Notes: Yearly earnings (in 100 SEK) are deflated to 2000 values using the national CPI. Yearly earnings are analyzed in 100 Swedish krona values (in 100 SEK). Ring 1: 0.00 km-3.16 km, ring 2: 3.17 km-3.82 km, ring 3: 3.83 km-4.61 km, ring 4: 4.62 km-26.68 km, ring 5: 26.69 km-82.84 km, ring 6: 82.85 km-131.33 km, and ring 7: 131.34 km-150.00 km. Ring 7 and year 2003 are the reference group. 95% confidence interval shown. Estimation includes marital status, having children under 18 years old, educational levels, and economic sectors as controls, as well as individual, grid, and time fixed effects. Standard errors are clustered at the grid level.

3.2.3 Employment

Next, as we do not have access to wage data, we analyze employment to disentangle whether the observed effects on earnings are attributable solely to increases in wages or hours worked by the employed, or to increased employment, both in terms of overall employment or employment in certain sectors. In this analysis, we use employment as the outcome, estimating the effect of the mining boom on the overall probability of being employed (Figure 8a and Online Appendix Table A.7) for the full sample of residents and allowing people to move between rings. As discussed previously, the coefficients identify the differential local dynamic impact of the economic shock on individuals close to the mine compared with those farther away. The results show no clear pattern of the effect of the mining boom on the probability of being employed. Figure 8a shows that the probability of being employed due to the mining boom increases in rings 5 and 6 compared with ring 7. For example, for those individuals located far from the mines but still treated to some extent (ring 5), we observe an average increase of 3.2 percentage points in the probability of being employed the first year after the shock (2004), compared with those in ring 7 (see Online Appendix Table A.7). In contrast, those individuals located in rings 1, 2, 3, and 4 do not experience the same positive effect of the mining boom. In addition, Figure 8b focuses on the effect of the mining boom on the probability of being employed in the mining sector by year and ring for the 2000-2015 period. As expected, individuals located in all examined rings, in comparison with those in ring 7, experience a significant increase in the probability of being employed in the mining sector because of the mining boom. For example, these individuals (ring 1) observe an average increase of 0.6 percentage points in the probability of being employed the first year after the shock (2004) compared with those in ring 7 and 2003 (see Online Appendix Table A.7). These effects increase with time. In 2011, the average increase in the probability of being employed is approximately 5.0 percentage points greater for those individuals located in ring 1 than that in ring 7, suggesting long-lasting direct effects of the economic shock on employment in the mining sector.

Interesting patterns appear when we analyze the employment dynamics for the remaining economic sectors. Figure 9 shows the sectoral diffusion or spillover effects of the mining boom on the employment of other sectors of the economy (Online Appendix Table A.7). We find evidence suggesting crowding-out effects on some sectors. The agricultural, construction, service, and other sectors perceive a negative effect on employment, which may be due to some individuals moving between sectors. On the other hand, the manufacturing and public sectors experience an increase in employment. These results do not align with those of previous studies. For example, Feyrer et al. (2017) shows that the oil and gas boom in the U.S. generates increases in employment, especially in the mining, transportation, and construction sectors. The patterns observed may be because those individuals located very close to the mines already worked in the mines before the economic shock. These results suggest that the effects of the mining boom on the labor market are driven primarily by an increase in earnings for individuals located close to mines, whereas for those far away, the increase is in employment. However, we cannot say with certainty whether this is the correct interpretation. It seems that the economic shock has led to a combination of new jobs and changing jobs between sectors, along with higher earnings for existing jobs. However, we cannot distinguish between these two effects.

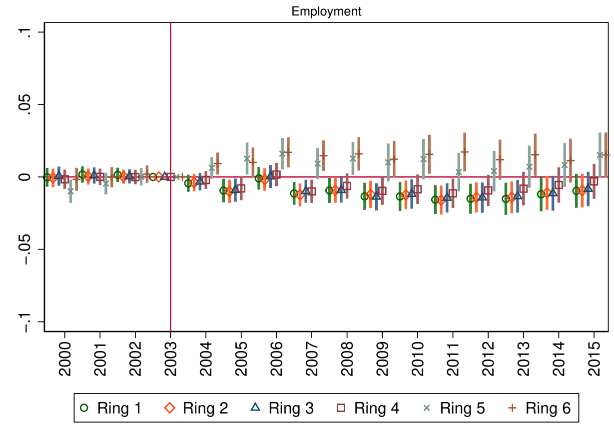


(a) Residents

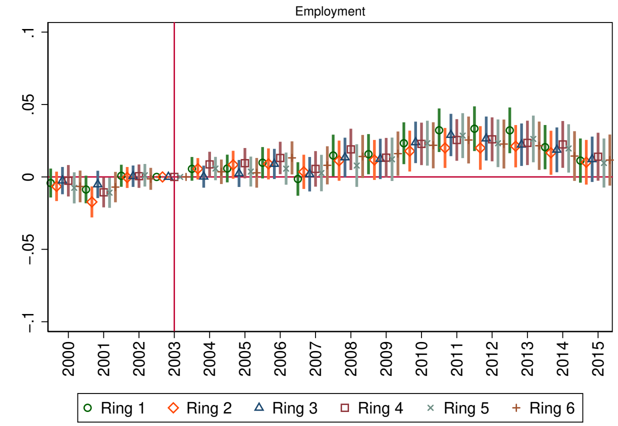
(b) Mining sector

Figure 8: Event study of the impact of the mining boom on overall employment and the mining sector, 2000-2015

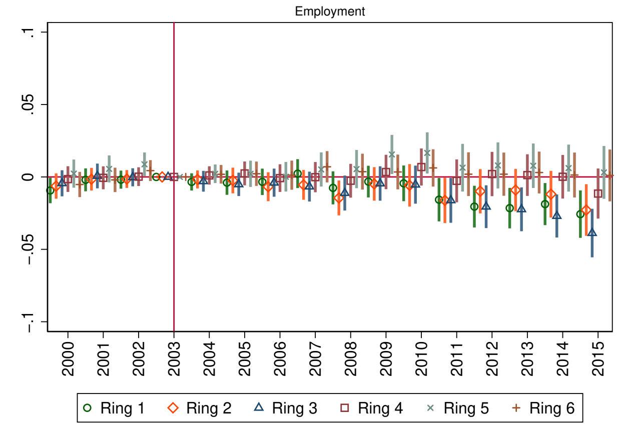
Notes: Ring 1: 0.00 km-3.16 km, ring 2: 3.17 km-3.82 km, ring 3: 3.83 km-4.61 km, ring 4: 4.62 km-26.68 km, ring 5: 26.69 km-82.84 km, ring 6: 82.85 km-131.33 km, and ring 7: 131.34 km-150.00 km. Ring 7 and year 2003 are the references. 95% confidence interval shown. Estimation includes marital status, having children under 18 years old, and educational levels as controls, as well as grid, and time fixed effects. Standard errors are clustered at the grid level.



(a) Agricultural sector



(b) Manufacturing sector



(c) Construction sector

(d) Service sector

(e) Public sector

(f) Other sector

Figure 9: Event study of the impact of the mining boom on employment by economic sector, 2000-2015

Notes: Ring 1: 0.00 km-3.16 km, ring 2: 3.17 km-3.82 km, ring 3: 3.83 km-4.61 km, ring 4: 4.62 km-26.68 km, ring 5: 26.69 km-82.84 km, ring 6: 82.85 km-131.33 km, and ring 7: 131.34 km-150.00 km. Ring 7 and year 2003 are the reference group. 95% confidence interval shown. Estimation includes marital status, having children under 18 years old, and educational levels as controls, as well as grid, and time fixed effects. Standard errors are clustered at the grid level.

3.3 Robustness checks

The estimated impacts of the mining boom on yearly earnings are robust to a variety of alternative specifications and robustness checks. These robustness checks focus only on the sample of residents. In Column (1) of Online Appendix Table A.8, we report the results from the baseline specification for reference. In Column (2), we reestimate the main results limiting the sample to individuals between 18 and 55 years old, which corresponds to the end of their "prime" working years. According to Jacobsen et al. (2023), this approach allows us to obtain results on the basis of exogenous changes in economic opportunities and exclude endogenous household-level choices related to retirement. This change has little effect on the coefficient estimates. In Column (3), grid fixed effects are replaced by municipality fixed effects to account for possible confounding omitted variables that vary at the municipality level. The results remain robust to this modification. In Column (4), we group the smaller rings (1, 2, and 3) into one ring. Thus, ring A1: 0.00 km-4.61 km, ring A2: 4.62 km-26.68 km, ring A3: 26.69 km-82.84 km, ring A4: 82.85 km-131.33 km, and ring A5: 131.34 km-150.00 km. Ring A5 is the reference group. This change has little effect on the coefficient estimates. In Column (5), we divide the post variable into three categories according to the time evolution of iron ore prices (Figure 1). We consider a preboom period (before 2004), a boom phase (2004-2011), and a bust phase (after 2011). This approach is important for analyzing the robustness of the long-lasting consequences of these shocks observed in Figure 4. The results remain robust, and the positive effects increase with time, providing evidence of a long-lasting effect of the mining boom that appears unaffected by the bust. In Column (6), we report two-way clustering standard errors by geography (grids) and year following Feyrer et al. (2017). Year clustering accounts for spatial correlation within a period, and geographic clustering accounts for correlation over time within a geographic group (Cameron et al., 2011). The results remain robust with larger standard errors. In Column (7), we omit the publicly employed workers following Katovich et al. (2023). The public sector in Sweden is characterized by job stability and a different wage-setting system and may not respond equally to market signals as other sectors do. The results remain robust to this change. In Columns (8) and (9), we perform separate analyses for individuals located in the municipalities of Gällivare and Kiruna. In this case, we drop the individuals in rings 6 and 7 because they live in different municipalities, and we use ring 5 as the reference. The results confirm that none of these municipalities drive the main results. Finally, because our dependent variable is in SEK levels, in Column (10), we winsorize the yearly earnings to omit individuals with too large earnings at the 99.0th percentile. The results remain robust to this change.

4 Conclusion

In this paper, we present new evidence of the diffusion of economic shocks in the labor market across space, time, and economic sectors. We use the mining boom in Sweden as a natural experiment to study the diffusion of economic shocks on individual labor market outcomes. We do so by combining geocoded microdata from administrative registers in Sweden and the geographical location of mines, allowing us to place individuals in space according to their location and follow them before, through, and after the economic shock. First, we explore the spatial diffusion of the shock, analyzing how the effects of exposure to the mining boom spread geographically. We find a significant improvement in the labor market conditions of treated individuals; specifically, greater exposure to mining leads to increases in earnings for the local population. Moreover, there is a significant spatial propagation of the effects of the economic shock. The mining boom affects individuals located as far as 83 km from the mines. These positive effects increase with time, providing evidence of a long-lasting effect of the mining boom (temporary economic shock) that appears unaffected by the bust. This result contrasts previous literature suggesting that the benefits of booms are usually lower than the losses from busts (Black et al., 2005b; James and Aadland, 2011; Jacobsen and Parker, 2016; Jacobsen et al., 2023). One plausible explanation for this phenomenon in Sweden is the stickiness of wages as a consequence of strong unions; The tradition of national and sectoral wage bargaining with set wage floors, implying a low probability of declining wages (Jäger et al., 2024).

Second, we evaluate *who* is affected by examining how the impacts of the shock vary across different economic sectors and demographic groups. We show large gains in earnings and employment for residents directly employed in the mining sector because of the mining boom. In addition, there are significant spillover effects on the earnings of individuals in other sectors. Workers in the manufacturing, construction, and service sectors experience a significant increase in earnings because of the mining boom.

Overall, these results suggest important improvements in the labor market conditions of the local population of mining areas due to a resource shock, effects that persist over time and spread across geographic and economic sectors. The results contribute to understanding how exogenous economic shocks affect local labor markets and how these effects propagate across space and the economy. Past work has focused predominantly on the energy sector, specifically the fracking boom in the US. The current work complements that literature and contributes to several other strands of empirical literature, including the spatial diffusion of the effects of economic shocks and the debate about whether natural resources are a blessing or a curse, among others. A key strength and novelty of our study lies in the use of a very rich data source. The data enable us to link the detailed labor market conditions of individuals with demographic characteristics and geographical information observed for the total Swedish population, shifting the focus of previous literature from place-based research to people and analyzing labor market adjustments at the individual level. As Jacobsen et al. (2023), we believe our study contributes to showing the importance of individual-level panel data for understanding how temporary shocks affect the welfare of residents in resource-endowed areas.

Although this study provides valuable empirical evidence, it is not without concerns. The main concern is the external validity of the estimates, which is constrained by the specific characteristics of a mining boom and the mining sector in a developed country such as Sweden. While the focus on the mining boom presents challenges in terms of generalizability, it is an important natural experiment that works as an opportunity to address concerns about economic shocks in general. While natural experiments classified as exogenous and that occur in clearly specified local areas are difficult to find, the mining boom examined here is one such case. For example, a difference between our results and those of previous studies in different contexts is related to the spatial diffusion of the effects of the economic shock. We find less propagation (up to 83 km) in comparison to previous studies that have found propagation from the fracking boom up to 241 km (Allcott and Keniston, 2018) or 160 km (Feyrer et al., 2017); such differences can be due to the location of the mines in the northern part of Sweden, which is a geographic area characterized by population decline and geographical separation from the remaining country. Owing to sociocultural differences, the findings from this paper may be more generalizable to mineral-rich boomtowns in developed countries such as Sweden. Future research should examine the heterogeneous effects of different mining minerals in different countries with heterogeneous institutions.

References

Adjei, E. K., Eriksson, R., and Lundberg, J. (2023). The effects of a large industrial investment on employment in a remote and sparsely populated area using a synthetic control approach. *Regional Science Policy & Practice*, 15(7):1553–1576.

Aguilar-Gomez, S. and Benshaul-Tolonen, A. (2023). The evolution and persistence of women's roles: Evidence from the gold rush. *Journal of Economic Behavior & Organization*, 215:364–381.

Åkerlund, D., Golsteyn, B. H., Grönqvist, H., and Lindahl, L. (2016). Time discounting and criminal behavior. *Proceedings of the National Academy of Sciences*, 113(22):6160–6165.

Allcott, H. and Keniston, D. (2018). Dutch disease or agglomeration? the local economic effects of natural resource booms in modern America. *The Review of Economic Studies*, 85(2):695–731.

Amarasinghe, A., Hodler, R., Raschky, P. A., and Zenou, Y. (2024). Key players in economic development. *Journal of Economic Behavior & Organization*, 223:40–56.

Andersson, M., Klaesson, J., and Larsson, J. P. (2014). The sources of the urban wage premium by worker skills: Spatial sorting or agglomeration economies? *Papers in Regional Science*, 93(4):727–748.

Andrews, I. and Kasy, M. (2019). Identification of and correction for publication bias. *American Economic Review*, 109(8):2766–2794.

Aragón, F. M. and Rud, J. P. (2013). Natural resources and local communities: evidence from a Peruvian gold mine. *American Economic Journal: Economic Policy*, 5(2):1–25.

Aragón, F. M. and Rud, J. P. (2016). Polluting industries and agricultural productivity: Evidence from mining in Ghana. *The Economic Journal*, 126(597):1980–2011.

Aragón, F. M., Rud, J. P., and Toews, G. (2018). Resource shocks, employment, and gender: evidence from the collapse of the uk coal industry. *Labour Economics*, 52:54–67.

Arbia, G. (2001). Modelling the geography of economic activities on a continuous space. *Papers in Regional Science*, 80(4):411–424.

Autor, D. H., Dorn, D., and Hanson, G. H. (2013). The China syndrome: Local labor market effects of import competition in the United States. *American Economic Review*, 103(6):2121–2168.

Auty, R. M. (1990). *Resource-based industrialization: Sowing the oil in eight developing countries*. Oxford university press.

Baffes, J. and Haniotis, T. (2010). Placing the recent commodity boom into perspective. *Food prices and rural poverty*, pages 40–70.

Bartik, A. W., Currie, J., Greenstone, M., and Knittel, C. R. (2019). The local economic and welfare consequences of hydraulic fracturing. *American Economic Journal: Applied Economics*, 11(4):105–155.

Bazillier, R. and Girard, V. (2020). The gold digger and the machine. evidence on the distributive effect of the artisanal and industrial gold rushes in Burkina Faso. *Journal of Development Economics*, 143:102411.

Benshaul-Tolonen, A., Chuhan-Pole, P., Dabalen, A., Kotsadam, A., and Sanoh, A. (2019). The local socioeconomic effects of gold mining: Evidence from Ghana. *The Extractive Industries and Society*, 6(4):1234–1255.

Bertrand, M., Duflo, E., and Mullainathan, S. (2004). How much should we trust differences-in-differences estimates? *The Quarterly Journal of Economics*, 119(1):249–275.

Black, D., McKinnish, T., and Sanders, S. (2005a). The economic impact of the coal boom and bust. *The Economic Journal*, 115(503):449–476.

Black, D., McKinnish, T., and Sanders, S. (2005b). Tight labor markets and the demand for education: Evidence from the coal boom and bust. *ILR Review*, 59(1):3–16.

Brown, J. P., Fitzgerald, T., and Weber, J. G. (2016). Capturing rents from natural resource abundance: Private royalties from US onshore oil & gas production. *Resource and Energy Economics*, 46:23–38.

Brunnschweiler, C. N. and Bulte, E. H. (2008). The resource curse revisited and revised: A tale of paradoxes and red herrings. *Journal of Environmental Economics and Management*, 55(3):248–264.

Butts, K. (2021). Difference-in-differences estimation with spatial spillovers. *arXiv preprint arXiv:2105.03737*.

Butts, K. (2023). JUE insight: Difference-in-differences with geocoded microdata. *Journal of Urban Economics*, 133:103493.

Callaway, B., Goodman-Bacon, A., and Sant'Anna, P. H. (2024). Difference-in-differences with a continuous treatment. Technical report, National Bureau of Economic Research.

Cameron, A. C., Gelbach, J. B., and Miller, D. L. (2011). Robust inference with multiway clustering. *Journal of Business & Economic Statistics*, 29(2):238–249.

Caselli, F. and Michaels, G. (2013). Do oil windfalls improve living standards? evidence from Brazil. *American Economic Journal: Applied Economics*, 5(1):208–238.

Cattaneo, M. D., Crump, R. K., Farrell, M. H., and Feng, Y. (2019). Binscatter regressions. *arXiv preprint arXiv:1902.09615*.

Cattaneo, M. D., Farrell, M. H., and Feng, Y. (2020). Large sample properties of partitioning-based series estimators.

Chávez, A. and Rodríguez-Puello, G. (2022). Commodity price shocks and the gender wage gap: Evidence from the metal mining prices super-cycle in Chile. *Resources Policy*, 76:102497.

Chen, J. and Roth, J. (2024). Logs with zeros? some problems and solutions. *The Quarterly Journal of Economics*, 139(2):891–936.

Chetty, R., Friedman, J. N., Stepner, M., and Team, O. I. (2023). The economic impacts of COVID-19: Evidence from a new public database built using private sector data. *The Quarterly Journal of Economics*, 139(2):829–889.

Christian, J. (2009). The effects of the financial crisis on metal markets. *World Bank Extractive Industries Week*, 148.

Christian, P. and Barrett, C. B. (2024). Spurious regressions and panel iv estimation: revisiting the causes of conflict. *The Economic Journal*, 134(659):1069–1099.

Cunningham, S. (2021). *Causal inference: The mixtape*. Yale university press.

Cust, J. and Poelhekke, S. (2015). The local economic impacts of natural resource extraction. *Annual Review of Resource Economics*, 7(1):251–268.

Diemer, A. (2024). Spatial diffusion of local economic shocks in social networks: Evidence from the US fracking boom. *Journal of Labor Economics*.

Erten, B. and Ocampo, J. A. (2013). Super cycles of commodity prices since the mid-nineteenth century. *World Development*, 44:14–30.

Farooki, M. and Kaplinsky, R. (2013). *The impact of China on global commodity prices: The global reshaping of the resource sector*, volume 57. Routledge.

Feyrer, J., Mansur, E., and Sacerdote, B. (2020). Geographic dispersion of economic shocks: Evidence from the fracking revolution: Reply. *American Economic Review*, 110(6):1914–1920.

Feyrer, J., Mansur, E. T., and Sacerdote, B. (2017). Geographic dispersion of economic shocks: Evidence from the fracking revolution. *American Economic Review*, 107(4):1313–1334.

Foote, A., Grosz, M., and Stevens, A. (2019). Locate your nearest exit: Mass layoffs and local labor market response. *ILR Review*, 72(1):101–126.

Franklin, S. and Labonne, J. (2019). Economic shocks and labor market flexibility. *Journal of Human Resources*, 54(1):171–199.

Freyaldenhoven, S., Hansen, C., Pérez, J. P., and Shapiro, J. M. (2021). Visualization, identification, and estimation in the linear panel event-study design. Technical report, National Bureau of Economic Research.

Gelb, A. H. et al. (1988). *Oil windfalls: Blessing or curse?* Oxford university press.

Gould, E. D. (2007). Cities, workers, and wages: A structural analysis of the urban wage premium. *The Review of Economic Studies*, 74(2):477–506.

Guettabi, M. and James, A. (2020). Who benefits from an oil boom? evidence from a unique Alaskan data set. *Resource and Energy Economics*, 62:101200.

Haley, S., Klick, M., Szymoniak, N., and Crow, A. (2011). Observing trends and assessing data for Arctic mining. *Polar Geography*, 34(1-2):37–61.

Huntington-Klein, N. (2021). *The effect: An introduction to research design and causality.* Chapman and Hall/CRC.

Jacobsen, G. D. and Parker, D. P. (2016). The economic aftermath of resource booms: evidence from boomtowns in the American West. *The Economic Journal*, 126(593):1092–1128.

Jacobsen, G. D., Parker, D. P., and Winikoff, J. B. (2023). Are resource booms a blessing or a curse?: Evidence from people (not places). *Journal of Human Resources*, 58(2):393–420.

Jäger, S., Naidu, S., and Schoefer, B. (2024). Collective bargaining, unions, and the wage structure: An international perspective. Technical report, National Bureau of Economic Research.

James, A. and Aadland, D. (2011). The curse of natural resources: An empirical investigation of US counties. *Resource and Energy Economics*, 33(2):440–453.

James, A. G. and Smith, B. (2020). Geographic dispersion of economic shocks: Evidence from the fracking revolution: Comment. *American Economic Review*, 110(6):1905–1913.

Kaplinsky, R. (2006). Revisiting the terms of trade revisited: what difference does China make? *World Development*, 34(6):981–995.

Katovich, E., Parker, D., and Poelhekke, S. (2023). Timing is everything: Labor market winners and losers during boom-bust cycles. Technical report, CEPR Discussion Papers.

Knobblock, E. A. and Pettersson, Ö. (2010). Restructuring and risk-reduction in mining: employment implications for northern Sweden. *Fennia-International Journal of Geography*, 188(1):61–75.

Kolak, M. and Anselin, L. (2020). A spatial perspective on the econometrics of program evaluation. *International Regional Science Review*, 43(1-2):128–153.

Kotsadam, A. and Tolonen, A. (2016). African mining, gender, and local employment. *World Development*, 83:325–339.

Kovalenko, A. (2023). Natural resource booms, human capital, and earnings: Evidence from linked education and employment records. *American Economic Journal: Applied Economics*, 15(2):184–217.

Mamo, N., Bhattacharyya, S., and Moradi, A. (2019). Intensive and extensive margins of mining and development: Evidence from Sub-Saharan Africa. *Journal of Development Economics*, 139:28–49.

Meyer, B. D. (1995). Natural and quasi-experiments in economics. *Journal of Business & Economic Statistics*, 13(2):151–161.

Michaels, G. (2011). The long term consequences of resource-based specialisation. *The Economic Journal*, 121(551):31–57.

Miller, D. L. (2023). An introductory guide to event study models. *Journal of Economic Perspectives*, 37(2):203–230.

Moretti, E. (2011). Local labor markets. In *Handbook of labor economics*, volume 4, pages 1237–1313. Elsevier.

Mullahy, J. and Norton, E. C. (2024). Why transform Y? the pitfalls of transformed regressions with a mass at zero. *Oxford Bulletin of Economics and Statistics*, 86(2):417–447.

Nordregio (2009). North Norden: a new mining era.

Nunn, N. and Qian, N. (2014). US food aid and civil conflict. *American Economic Review*, 104(6):1630–1666.

Pellandra, A. (2015). The commodity price boom and regional workers in Chile: a natural resources blessing. *Unpublished manuscript*.

Pelzl, P. and Poelhekke, S. (2021). Good mine, bad mine: Natural resource heterogeneity and dutch disease in Indonesia. *Journal of International Economics*, 131:103457.

Pérez, M. and Rodríguez-Puello, G. (2022). Economic shocks and their effect on the schooling and labor participation of youth: evidence from the metal mining price boom in Chilean counties. *The Annals of Regional Science*, 68(1):65–93.

Ploeg, F. v. d. (2011). Natural resources: curse or blessing? *Journal of Economic Literature*, 49(2):366–420.

Radetzki, M., Eggert, R. G., Lagos, G., Lima, M., and Tilton, J. E. (2008). The boom in mineral markets: How long might it last? *Resources Policy*, 33(3):125–128.

Rajbhandari, I., Faggian, A., and Partridge, M. D. (2022). Oil and gas boomtowns and occupations: What types of jobs are created? *Energy Economics*, 115:106321.

Reeson, A. F., Measham, T. G., and Hosking, K. (2012). Mining activity, income inequality and gender in regional Australia. *Australian Journal of Agricultural and Resource Economics*, 56(2):302–313.

Rehner, J. and Vergara, F. (2014). Efectos recientes de la actividad exportadora sobre la reestructuración económica urbana en Chile. *Revista de Geografía Norte Grande*, (59):83–103.

Richter, J., Salanguit, A., and James, A. (2018). The (uneven) spatial distribution of the Bakken oil boom. *Land Economics*, 94(4):577–592.

Rodríguez-Puello, G. (2025). Socioeconomic well-being in the face of commodity price shocks: Evidence from Chile. *The Journal of Development Studies*, pages 1–29.

SGU (2014). Statistics of the Swedish mining industry 2013.

SGU (2021). Statistics of the Swedish mining industry 2021.

Singleton, K. J. (2014). Investor flows and the 2008 boom/bust in oil prices. *Management Science*, 60(2):300–318.

Swedish Agency for Growth Policy Analysis, G. (2015). Sverige – ett attraktivt gruvland i världen? en internationell jämförelse.

Tano, S., Pettersson, Ö., and Stjernström, O. (2016). Labour income effects of the recent "mining boom" in northern Sweden. *Resources Policy*, 49:31–40.

Van der Ploeg, F. and Poelhekke, S. (2010). The pungent smell of “red herrings”: Subsoil assets, rents, volatility and the resource curse. *Journal of Environmental Economics and Management*, 60(1):44–55.

Vazquez-Bare, G. (2023). Identification and estimation of spillover effects in randomized experiments. *Journal of Econometrics*, 237(1):105237.

Von der Goltz, J. and Barnwal, P. (2019). Mines: The local wealth and health effects of mineral mining in developing countries. *Journal of Development Economics*, 139:1–16.

Wang, R., Zameer, H., Feng, Y., Jiao, Z., Xu, L., and Gedikli, A. (2019). Revisiting Chinese resource curse hypothesis based on spatial spillover effect: a fresh evidence. *Resources Policy*, 64:101521.

Wilson, N. (2012). Economic booms and risky sexual behavior: evidence from Zambian copper mining cities. *Journal of Health Economics*, 31(6):797–812.

Winters, J. V., Cai, Z., Maguire, K., and Sengupta, S. (2021). Causal effects of the fracking boom on long-term resident workers. *Journal of Regional Science*, 61(2):387–406.

Yankow, J. J. (2006). Why do cities pay more? an empirical examination of some competing theories of the urban wage premium. *Journal of Urban Economics*, 60(2):139–161.

Online Appendix

Diffusion of Economic Shocks in the Labor Market: Evidence from a Mining Boom and Bust

Gabriel Rodríguez-Puello[1] and Jonna Rickardsson[1]

[1]Centre for Entrepreneurship and Spatial Economics (CEnSE), Jönköping International Business School (JIBS), Jönköping University, Sweden

February 19, 2025

Corresponding author. Email: gabriel.rodriguez@ju.se

A Appendix: Additional tables

Table A.1: Mining municipalities, mines and mining employment share

County	Municipality	Mine(s) and main product(s)	Population 2015	Mining employment share 2003	2010	2015
Norrbotten	Gällivare	Malmberget (Iron ore) and Aitik (Copper)	18,123	17.44%	20.89%	22.56%
Norrbotten	Kiruna	Kirunavaara (Iron ore) and Gruvberget (Iron ore)	23,178	13.94%	16.51%	18.44%
Västerbotten	Lycksele	Kristineberg (Copper/zinc) and Svartliden (Gold)	12,177	1.50%	1.97%	1.70%
Västerbotten	Malå	Storliden (Zinc/copper)	3,109	4.93%	6.10%	7.64%
Västerbotten	Norsjö	Maurliden (Copper/zinc) and Maurliden Ö (Copper/zinc)	4,176	2.92%	2.68%	4.69%
Västerbotten	Skelleftea	Björkdal (Gold) and Renström (Copper/zinc)	72,031	1.82%	1.88%	2.61%
Västerbotten	Sorsele	Blaiken (Zinc)	2,516	0.52%	1.37%	0.99%
Västerbotten	Storuman	Svartliden (Gold) and Blaiken (Zinc)	5,943	0.75%	0.80%	1.07%
Örebro	Askersund	Zinkgruvan (Zinc)	11,151	7.24%	7.39%	7.75%
Dalarna	Hedemora	Garpenberg (Zinc)	15,235	3.24%	3.35%	4.40%

Notes: Information from Statistics Sweden, Nordregio (2009), SGU (2014), Tano et al. (2016), and SGU (2021). Following Tano et al. (2016), municipalities are considered if they had an operating mine during the mining boom ranging from 2004 to 2010. Employment in the mining sector via the Swedish Standard Industrial (SNI) Classification 2002 includes the codes 10100, 10200, 10301, 10302, 12000, 13100, 13200, 14110, 14120, 14130, 14210, 14220, 14300, 14400, 14500, 29520, and 51820.

Table A.2: Mean differences of changes (2000-2003) comparing each ring with ring 7

	Ring 1	Ring 7	Ring 2	Ring 7	Ring 3	Ring 7	Ring 4	Ring 7	Ring 5	Ring 7	Ring 6	Ring 7
Earnings(100SEK)	52.85	19.21*	16.88	19.21	49.61	19.21	68.08	19.21**	73.11	19.21***	49.92	19.21
Employment	-0.00	-0.02**	-0.01	-0.02	-0.00	-0.02*	-0.00	-0.02**	0.01	-0.02***	-0.00	-0.02*
Distance to mine(km)	-1.45	0.98***	-1.08	0.98***	-0.54	0.98***	-0.27	0.98***	1.79	0.98***	1.87	0.98***
Married	-0.01	0.00*	0.00	0.00	0.01	0.00**	0.01	0.00	0.00	0.00	-0.00	0.00
Children under 18	-0.03	-0.04	-0.03	-0.04	-0.03	-0.04	-0.02	-0.04**	-0.03	-0.04	-0.04	-0.04
Primary education	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03
Secondary education	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.03	0.02
Tertiary education	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.01
Non-employed	0.00	0.02**	0.01	0.02	0.00	0.02*	0.00	0.02**	-0.01	0.02***	0.00	0.02*
Primary sector	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	0.01	-0.00**	0.01	-0.00**	0.00	-0.00
Secondary sector	-0.00	-0.01**	-0.00	-0.01*	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.00	-0.01
Tertiary sector	0.00	-0.00	0.00	-0.00	0.01	-0.00	0.00	-0.00	0.01	-0.00	0.00	-0.00

Notes: Each value represents a change between 2000 and 2003. Yearly earnings (in 100 SEK) are deflated to 2001 values via the national CPI. Yearly earnings are analyzed in 100 Swedish krona values (in 100 SEK). Ring 1: 0.00 km-3.16 km, ring 2: 3.17 km-3.82 km, ring 3: 3.83 km-4.61 km, ring 4: 4.62 km-26.68 km, ring 5: 26.69 km-82.84 km, ring 6: 82.85 km-131.33 km, and ring 7: 131.34 km-150.00 km. Marital status is a dummy variable equal to 1 if the individual is married and 0 otherwise. The educational level is divided into primary, secondary, and tertiary levels. The economic sector is divided into primary, secondary, and tertiary sectors. The primary sector includes the extraction and agricultural sector; the secondary sector includes manufacturing and construction; and the tertiary sector includes services, healthcare, the public sector, and others. $^{*}\ p < 0.1$, $^{**}\ p < 0.05$, $^{***}\ p < 0.01$.

Table A.3: Impact of the mining boom on yearly earnings (100SEK), 2000-2015

	(1)	(2)
	β / SE	β / SE
Post*Ring 1	294.121***	273.441***
	(22.236)	(19.287)
Post*Ring 2	271.307***	234.860***
	(21.007)	(16.668)
Post*Ring 3	252.734***	246.234***
	(21.716)	(17.639)
Post*Ring 4	245.942***	228.216***
	(22.012)	(17.294)
Post*Ring 5	149.854***	66.510***
	(20.921)	(20.769)
Post*Ring 6	113.940***	41.208**
	(19.053)	(16.315)
Married		81.373***
		(8.481)
Children under 18		-124.798***
		(5.644)
Primary education		-707.056***
		(20.469)
Secondary education		-394.729***
		(17.334)
Primary sector		1711.274***
		(36.940)
Secondary sector		1416.729***
		(12.484)
Tertiary sector		1234.676***
		(9.465)
Constant	1673.926***	1203.145***
	(10.686)	(23.554)
Individual FE	Yes	Yes
Year FE	Yes	Yes
Grid FE	Yes	Yes
Nxt	566165	566165
N	35385	35385
Mean dep. var	1824	1824
R-squared	0.750	0.819
Within R-squared	0.002	0.280

Notes: Two-way fixed effects panel data regression. Yearly earnings (in 100 SEK) are deflated to 2000 values via the national CPI. Yearly earnings are analyzed in 100 Swedish krona values (in 100 SEK). Ring 1: 0.00 km-3.16 km, ring 2: 3.17 km-3.82 km, ring 3: 3.83 km-4.61 km, ring 4: 4.62 km-26.68 km, ring 5: 26.69 km-82.84 km, ring 6: 82.85 km-131.33 km, and ring 7: 131.34 km-150.00 km. Ring 7, tertiary education, and nonemployed are the reference groups for the interaction, educational level, and economic sector, respectively.

All the estimations include individual, grid, and time fixed effects. Standard errors (in parentheses) are clustered at the grid level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.4: Impact of the mining boom on yearly earnings (100SEK), 2000-2015

	(1) Residents and migrants	(2) Agricultural sect.	(3) Manufacturing sect.	(4) Construction sect.	(5) Service sect.	(6) Public sect.	(7) Other sect.
	β / SE	β / SE	β / SE	β / SE	β / SE	β / SE	β / SE
2000*Ring 1	5.260	-326.998*	22.474	45.704	-48.044	17.119	-44.061
	(20.399)	(198.396)	(69.054)	(91.941)	(48.949)	(39.502)	(68.888)
2000*Ring 2	19.160	247.408	109.115	93.242	-34.794	34.541	-79.454
	(20.163)	(329.874)	(82.687)	(90.679)	(49.791)	(42.958)	(79.181)
2000*Ring 3	15.062	-52.721	8.558	18.451	-1.343	8.053	-65.426
	(19.632)	(116.168)	(71.021)	(85.555)	(49.837)	(41.919)	(68.694)
2000*Ring 4	-12.437	132.974	-67.735	55.600	-5.736	12.651	-21.425
	(20.225)	(183.140)	(60.436)	(101.224)	(50.149)	(40.376)	(74.188)
2000*Ring 5	-23.018	-43.482	-18.744	-30.731	-103.036**	27.654	10.948
	(19.988)	(97.617)	(60.799)	(109.388)	(51.676)	(38.052)	(74.546)
2000*Ring 6	-6.318	-28.296	88.091	65.760	-20.451	-13.916	-42.836
	(19.540)	(101.006)	(55.184)	(93.326)	(50.439)	(39.745)	(76.110)
2001*Ring 1	-11.502	-348.044**	73.752	-33.580	-44.877	9.103	-94.460
	(17.949)	(151.721)	(59.651)	(91.783)	(44.050)	(38.135)	(69.326)
2001*Ring 2	-1.859	28.149	101.271	87.003	-64.543	30.733	-109.850
	(17.746)	(166.223)	(86.601)	(86.085)	(41.952)	(36.207)	(75.693)
2001*Ring 3	-10.805	-143.126	62.309	-0.346	-52.341	-30.166	-102.155
	(17.184)	(99.486)	(61.929)	(78.255)	(43.043)	(37.018)	(64.702)
2001*Ring 4	-14.180	-124.359	-22.211	-6.517	-50.128	33.934	-66.001
	(17.488)	(131.044)	(52.401)	(90.404)	(43.675)	(35.909)	(72.939)
2001*Ring 5	-36.685**	-130.839	-74.497	-84.733	-98.142**	-3.645	-12.878
	(18.181)	(84.475)	(53.622)	(105.757)	(45.866)	(33.620)	(71.534)
2001*Ring 6	-19.658	-70.141	53.503	9.818	-57.420	-22.190	-40.429
	(17.317)	(84.002)	(50.643)	(83.526)	(45.673)	(34.532)	(74.937)
2002*Ring 1	-34.723**	-93.241	-65.042	0.894	-42.611	-9.490	-6.630
	(14.364)	(95.129)	(47.975)	(74.132)	(35.009)	(29.049)	(54.774)
2002*Ring 2	-11.874	-200.451	-24.385	85.810	-12.837	49.411*	-92.270
	(13.357)	(173.060)	(55.222)	(65.800)	(33.702)	(28.404)	(59.975)
2002*Ring 3	-12.789	-67.143	-23.939	4.097	-19.715	-7.078	-32.774
	(13.599)	(91.435)	(50.101)	(62.843)	(33.742)	(25.932)	(55.524)
2002*Ring 4	-36.364***	-41.525	-45.812	31.432	-58.167*	50.629*	-34.755
	(13.408)	(168.543)	(42.751)	(77.206)	(35.157)	(28.194)	(54.520)
2002*Ring 5	-47.870***	-120.103*	-54.819	-146.995*	-91.029**	1.106	-33.246
	(13.522)	(67.695)	(42.199)	(79.746)	(36.137)	(25.680)	(59.975)
2002*Ring 6	-27.454**	-121.989*	20.672	-68.653	-30.192	3.552	7.620
	(13.326)	(70.968)	(42.653)	(70.797)	(37.575)	(26.206)	(64.807)
2004*Ring 1	83.766***	29.404	105.478**	-13.110	65.996**	25.097	9.171
	(12.582)	(78.276)	(51.413)	(67.203)	(33.080)	(26.460)	(51.262)
2004*Ring 2	65.093***	50.143	67.585	15.948	41.830	52.263*	67.563
	(14.059)	(160.463)	(48.747)	(65.395)	(32.227)	(27.979)	(68.397)
2004*Ring 3	73.153***	205.105*	76.437	106.706*	15.524	42.511*	34.530

	(12.845)	(114.710)	(59.559)	(63.078)	(32.602)	(23.459)	(53.755)
2004*Ring 4	77.127***	23.985	76.020*	115.889*	44.248	80.722***	21.220
	(12.959)	(134.167)	(41.880)	(70.047)	(33.805)	(25.256)	(48.683)
2004*Ring 5	7.690	100.614	-17.138	-18.186	22.909	60.514**	34.676
	(14.768)	(67.498)	(48.398)	(74.968)	(37.291)	(25.651)	(51.131)
2004*Ring 6	2.856	106.589	74.235**	-1.372	-15.695	38.301	18.758
	(13.767)	(68.665)	(37.597)	(72.644)	(35.937)	(23.909)	(61.938)
2005*Ring 1	137.945***	-28.267	251.692***	74.033	63.492	17.526	62.498
	(19.971)	(98.762)	(64.692)	(87.497)	(41.252)	(35.725)	(67.486)
2005*Ring 2	101.542***	-68.694	177.497**	117.555	39.732	59.103*	44.259
	(15.350)	(204.725)	(69.828)	(80.553)	(40.561)	(31.227)	(74.267)
2005*Ring 3	123.185***	105.850	219.347***	184.694**	28.430	63.688**	87.621
	(16.023)	(172.745)	(70.080)	(80.821)	(42.004)	(30.819)	(64.695)
2005*Ring 4	130.546***	-121.667	276.848***	191.678**	60.919	75.624***	112.669*
	(16.733)	(155.617)	(60.831)	(86.202)	(43.656)	(29.050)	(61.909)
2005*Ring 5	16.762	94.640	106.442**	16.492	15.511	32.519	110.612
	(18.055)	(87.999)	(52.741)	(87.258)	(44.533)	(28.829)	(68.917)
2005*Ring 6	12.814	115.363	85.407*	74.689	2.331	32.109	122.276
	(16.285)	(74.586)	(48.751)	(85.459)	(43.912)	(28.596)	(75.476)
2006*Ring 1	174.333***	-53.177	278.108***	245.258***	38.544	24.853	40.274
	(20.122)	(111.813)	(70.761)	(85.125)	(49.434)	(34.286)	(70.718)
2006*Ring 2	148.769***	-27.400	282.827***	370.241***	74.492	65.685*	25.661
	(19.216)	(231.636)	(79.444)	(92.616)	(45.746)	(34.384)	(90.171)
2006*Ring 3	147.424***	63.439	284.503***	293.657***	63.381	65.265**	67.235
	(19.598)	(209.750)	(92.659)	(84.508)	(48.455)	(32.123)	(73.530)
2006*Ring 4	147.776***	-14.694	355.552***	333.122***	31.638	82.795**	90.399
	(19.046)	(186.948)	(80.991)	(93.808)	(49.684)	(32.689)	(74.598)
2006*Ring 5	5.824	-2.223	72.995	97.150	-56.180	43.009	42.241
	(20.267)	(92.063)	(60.305)	(94.132)	(52.118)	(32.098)	(76.036)
2006*Ring 6	20.651	99.349	168.649***	185.366*	-37.072	37.823	25.441
	(18.684)	(85.726)	(57.399)	(95.755)	(50.481)	(31.669)	(81.212)
2007*Ring 1	199.388***	33.429	215.715**	193.716**	102.009**	7.849	14.843
	(19.344)	(155.165)	(88.850)	(84.448)	(50.905)	(42.704)	(73.018)
2007*Ring 2	189.602***	-169.292	268.009***	347.200***	153.737***	88.277**	-8.647
	(20.429)	(176.019)	(87.948)	(88.040)	(50.032)	(42.543)	(79.703)
2007*Ring 3	184.328***	151.465	165.958	277.329***	120.488**	63.057	23.358
	(19.440)	(238.627)	(107.959)	(89.344)	(50.100)	(44.821)	(71.725)
2007*Ring 4	162.563***	28.862	355.410***	290.331***	110.299**	86.334*	16.913
	(18.938)	(233.509)	(99.284)	(88.051)	(50.978)	(44.357)	(73.757)
2007*Ring 5	25.255	-37.862	28.641	73.001	36.226	22.421	111.560
	(21.814)	(96.859)	(67.227)	(102.580)	(56.249)	(45.882)	(79.318)
2007*Ring 6	12.865	118.084	108.537*	166.022*	10.576	36.085	9.886
	(19.404)	(92.996)	(59.483)	(92.762)	(53.481)	(42.851)	(81.852)
2008*Ring 1	224.441***	25.127	342.636***	231.039**	128.017**	0.165	31.368
	(22.605)	(139.555)	(98.347)	(93.748)	(54.358)	(48.960)	(69.025)
2008*Ring 2	213.260***	-38.398	425.034***	312.591***	215.012***	89.372*	-6.420

	(20.987)	(209.831)	(93.846)	(96.191)	(52.628)	(45.652)	(81.235)
2008*Ring 3	197.972***	5.676	252.267**	234.112**	155.746***	77.128*	22.254
	(20.252)	(247.826)	(123.040)	(91.811)	(53.639)	(43.784)	(69.693)
2008*Ring 4	174.594***	-61.394	375.136***	270.427***	173.861***	81.252*	29.900
	(21.528)	(240.108)	(94.458)	(99.057)	(54.295)	(44.920)	(70.644)
2008*Ring 5	23.147	-51.974	119.819	135.245	35.675	6.739	136.895*
	(23.442)	(99.757)	(82.350)	(96.400)	(55.717)	(48.731)	(77.666)
2008*Ring 6	14.259	71.905	142.007**	170.019	36.360	28.062	10.818
	(21.043)	(95.736)	(70.164)	(105.834)	(57.150)	(45.781)	(80.397)
2009*Ring 1	235.164***	12.306	395.864***	291.062***	182.190***	-28.777	41.282
	(24.914)	(156.575)	(96.046)	(92.182)	(59.561)	(44.419)	(69.711)
2009*Ring 2	219.228***	-152.911	406.995***	305.993***	264.304***	72.403	2.755
	(22.135)	(220.701)	(105.476)	(92.244)	(55.855)	(46.765)	(81.826)
2009*Ring 3	222.346***	143.592	380.166***	247.578***	238.846***	76.776*	53.371
	(23.232)	(353.709)	(130.348)	(89.131)	(56.269)	(44.002)	(71.994)
2009*Ring 4	199.511***	-173.860	432.173***	340.159***	230.514***	66.369	22.176
	(22.691)	(245.924)	(97.299)	(99.928)	(55.258)	(45.816)	(72.821)
2009*Ring 5	34.775	-25.476	64.017	203.990**	51.217	-8.196	155.856*
	(25.760)	(112.475)	(87.838)	(93.953)	(59.028)	(48.845)	(80.275)
2009*Ring 6	34.990	75.817	197.922***	238.842**	61.262	25.589	39.453
	(22.749)	(105.028)	(70.486)	(107.984)	(58.338)	(47.583)	(82.883)
2010*Ring 1	374.030***	-87.975	453.351***	394.919***	250.270***	-10.711	85.783
	(30.986)	(179.044)	(99.371)	(103.845)	(60.796)	(50.831)	(72.040)
2010*Ring 2	325.377***	-84.214	600.388***	441.734***	310.409***	82.426*	65.061
	(24.659)	(232.932)	(116.463)	(103.796)	(56.384)	(50.047)	(84.707)
2010*Ring 3	327.276***	295.021	475.126***	294.023***	293.844***	131.861***	130.748*
	(25.267)	(397.023)	(136.517)	(103.035)	(56.077)	(46.819)	(75.961)
2010*Ring 4	288.979***	-195.125	587.254***	405.716***	234.599***	72.529	79.544
	(26.221)	(280.900)	(96.759)	(113.455)	(58.630)	(51.714)	(77.930)
2010*Ring 5	63.597**	3.410	108.935	278.866**	36.222	-28.726	164.738*
	(27.663)	(119.580)	(93.550)	(116.600)	(63.187)	(52.423)	(85.044)
2010*Ring 6	46.700*	118.517	300.483***	188.369	50.059	27.987	58.571
	(24.892)	(108.068)	(75.756)	(120.371)	(60.641)	(52.062)	(84.929)
2011*Ring 1	415.813***	-194.033	696.394***	382.377***	265.030***	8.102	86.667
	(28.879)	(256.172)	(102.813)	(104.884)	(67.601)	(52.009)	(73.171)
2011*Ring 2	379.151***	-80.648	665.332***	487.686***	367.112***	83.165	107.277
	(25.336)	(252.079)	(114.988)	(109.322)	(59.607)	(55.110)	(88.303)
2011*Ring 3	355.496***	110.435	575.146***	347.171***	278.449***	103.273**	115.452
	(26.607)	(440.809)	(140.285)	(106.494)	(62.228)	(50.833)	(75.764)
2011*Ring 4	317.615***	-83.118	622.034***	457.901***	268.653***	62.390	70.159
	(28.096)	(274.656)	(103.050)	(114.861)	(64.283)	(50.653)	(81.385)
2011*Ring 5	88.874***	2.989	268.204***	344.764***	44.496	-43.041	179.707**
	(27.890)	(122.112)	(93.988)	(114.030)	(66.108)	(54.888)	(84.152)
2011*Ring 6	36.674	59.205	263.707***	233.470*	27.101	8.124	48.408
	(26.288)	(108.922)	(80.139)	(122.470)	(65.451)	(53.527)	(86.129)
2012*Ring 1	448.310***	6.544	735.620***	346.156***	341.691***	60.682	96.200

	(32.051)	(210.502)	(117.789)	(117.339)	(68.618)	(65.965)	(79.437)
2012*Ring 2	392.435***	-133.931	778.099***	446.718***	351.055***	143.779**	157.529*
	(29.254)	(240.528)	(128.821)	(122.630)	(64.367)	(63.749)	(88.184)
2012*Ring 3	405.893***	279.160	599.185***	391.994***	316.443***	186.863***	171.338**
	(28.553)	(477.999)	(161.985)	(121.640)	(66.610)	(61.413)	(79.208)
2012*Ring 4	343.537***	20.184	679.047***	448.366***	351.296***	93.221	58.422
	(31.009)	(286.976)	(124.698)	(124.071)	(70.217)	(60.942)	(87.966)
2012*Ring 5	79.272**	35.614	225.928*	266.734**	69.265	-0.105	218.673**
	(31.200)	(127.057)	(119.990)	(127.278)	(71.890)	(64.904)	(91.686)
2012*Ring 6	49.684*	122.660	293.538***	178.768	97.507	71.380	68.981
	(28.927)	(115.662)	(100.747)	(131.917)	(71.821)	(66.188)	(91.005)
2013*Ring 1	488.730***	16.139	787.286***	420.029***	393.679***	-42.441	69.852
	(34.697)	(226.641)	(121.966)	(125.498)	(72.138)	(68.517)	(74.378)
2013*Ring 2	435.984***	-222.703	897.656***	451.981***	430.678***	134.959**	103.734
	(31.838)	(226.497)	(128.733)	(128.473)	(69.587)	(61.435)	(89.291)
2013*Ring 3	470.760***	400.568	710.666***	389.329***	383.157***	163.311***	180.486**
	(29.390)	(468.154)	(164.552)	(130.974)	(69.554)	(61.408)	(78.408)
2013*Ring 4	379.595***	40.374	852.759***	403.520***	385.566***	42.467	60.627
	(33.074)	(328.120)	(123.596)	(129.992)	(75.169)	(62.559)	(83.810)
2013*Ring 5	100.357***	1.987	417.301***	227.246*	81.727	-23.831	237.764**
	(34.264)	(133.979)	(119.973)	(135.338)	(78.215)	(66.136)	(92.511)
2013*Ring 6	68.776**	133.622	294.377***	137.675	120.694	13.990	75.359
	(30.628)	(120.572)	(101.396)	(137.702)	(77.077)	(65.416)	(88.999)
2014*Ring 1	493.725***	-70.035	748.200***	365.678***	437.831***	1.214	25.609
	(37.114)	(270.408)	(140.391)	(134.311)	(79.672)	(71.820)	(75.535)
2014*Ring 2	435.820***	-150.401	812.784***	390.693***	471.743***	133.669**	75.593
	(30.395)	(278.611)	(139.306)	(130.138)	(72.717)	(66.820)	(91.560)
2014*Ring 3	473.912***	332.646	763.846***	362.915***	431.538***	171.731**	153.568*
	(32.049)	(568.519)	(168.861)	(137.925)	(75.751)	(68.285)	(86.036)
2014*Ring 4	379.795***	72.259	686.451***	467.578***	424.769***	56.882	7.466
	(33.310)	(366.046)	(123.919)	(136.464)	(79.277)	(69.892)	(89.014)
2014*Ring 5	114.911***	-25.427	373.990***	218.747	104.764	7.721	205.639**
	(37.180)	(150.898)	(125.436)	(141.100)	(82.359)	(73.270)	(91.778)
2014*Ring 6	85.671***	116.135	245.617**	157.536	156.483*	-0.232	55.308
	(32.186)	(134.450)	(106.138)	(146.204)	(84.123)	(75.902)	(92.500)
2015*Ring 1	503.237***	-31.944	632.306***	423.804***	457.615***	-34.382	60.434
	(37.731)	(273.164)	(134.347)	(147.510)	(81.853)	(70.520)	(84.162)
2015*Ring 2	443.742***	-49.413	676.596***	331.384**	456.892***	105.484	83.952
	(35.344)	(319.399)	(141.059)	(146.866)	(78.298)	(68.949)	(101.120)
2015*Ring 3	482.411***	114.266	693.454***	332.809**	448.887***	184.821***	157.350*
	(33.720)	(539.758)	(178.743)	(152.099)	(77.855)	(66.988)	(92.238)
2015*Ring 4	391.475***	50.330	558.282***	454.220***	391.667***	0.801	59.948
	(35.132)	(348.647)	(144.181)	(149.948)	(81.433)	(72.924)	(95.634)
2015*Ring 5	113.189***	-98.602	188.986	194.459	120.871	-22.364	255.557***
	(39.640)	(159.131)	(131.105)	(155.581)	(85.276)	(77.929)	(98.844)
2015*Ring 6	49.351	71.951	198.042*	128.867	89.655	-26.775	69.950

	(35.200)	(149.905)	(115.895)	(160.879)	(86.123)	(77.997)	(98.122)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Individual FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Grid FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Nxt	566165	12936	30098	34596	113429	85747	77485
N	35385	808	1881	2162	7089	5359	4843
Mean dep. var	1824	1046	2226	2635	2174	2196	2243
R-squared	0.820	0.886	0.805	0.762	0.798	0.803	0.839
Within R-squared	0.284	0.015	0.038	0.029	0.020	0.016	0.018

Notes: Two-way fixed effects panel data regression. Yearly earnings (in 100 SEK) are deflated to 2000 values via the national CPI. Yearly earnings are analyzed in 100 Swedish krona values (in 100 SEK). Ring 1: 0.00 km-3.16 km, ring 2: 3.17 km-3.82 km, ring 3: 3.83 km-4.61 km, ring 4: 4.62 km-26.68 km, ring 5: 26.69 km-82.84 km, ring 6: 82.85 km-131.33 km, and ring 7: 131.34 km-150.00 km. Ring 7 and the year 2003 are the reference group. All the estimations include marital status, having children under 18 years old, educational levels, and economic sectors as controls, as well as individual, grid, and time fixed effects. Standard errors (in parentheses) are clustered at the grid level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.5: Impact of the mining boom on yearly earnings (100SEK) for workers in the mining sector, 2000-2015

	(1) Mining sector each year β / SE	(2) Mining sector in 2003 β / SE
2000*Mining	42.031***	
	(14.520)	
2001*Mining	63.349***	
	(13.253)	
2002*Mining	-22.951**	
	(11.532)	
2004*Mining	143.700***	
	(11.484)	
2005*Mining	301.144***	
	(15.490)	
2006*Mining	386.887***	
	(14.354)	
2007*Mining	390.500***	
	(17.874)	
2008*Mining	407.069***	
	(18.053)	
2009*Mining	363.956***	
	(18.430)	
2010*Mining	726.771***	
	(20.964)	
2011*Mining	738.658***	
	(21.715)	
2012*Mining	763.601***	
	(21.932)	
2013*Mining	804.389***	
	(22.376)	
2014*Mining	734.662***	
	(23.231)	
2015*Mining	679.523***	
	(25.065)	
2000*Mining 2003		-15.037
		(15.803)
2001*Mining 2003		31.039**
		(13.657)
2002*Mining 2003		-16.893
		(11.452)
2004*Mining 2003		166.950***
		(10.576)
2005*Mining 2003		310.085***
		(16.797)

2006*Mining 2003		350.513***
		(15.538)
2007*Mining 2003		329.902***
		(17.292)
2008*Mining 2003		341.900***
		(18.159)
2009*Mining 2003		299.285***
		(19.598)
2010*Mining 2003		603.341***
		(22.602)
2011*Mining 2003		579.500***
		(25.479)
2012*Mining 2003		569.072***
		(28.326)
2013*Mining 2003		592.175***
		(28.229)
2014*Mining 2003		521.656***
		(29.799)
2015*Mining 2003		471.514***
		(31.776)
Controls	Yes	Yes
Individual FE	Yes	Yes
Year FE	Yes	Yes
Grid FE	Yes	Yes
Nxt	402087	366121
N	25130	22883
Mean dep. var	2340	2373
R-squared	0.772	0.769
Within R-squared	0.061	0.016

Notes: Two-way fixed effects panel data regression. Yearly earnings (in 100 SEK) are deflated to 2000 values via the national CPI. Yearly earnings are analyzed in 100 Swedish krona values (in 100 SEK). Nonemployed individuals are excluded from the sample. Workers in all other sectors and the year 2003 are the reference groups. The estimations include marital status, having children under 18 years old, and educational levels as controls, as well as individual, grid, and time fixed effects. Standard errors (in parentheses) are clustered at the grid level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.6: Heterogeneity analysis: impact of the mining boom on yearly earnings (100SEK) for residents, 2000-2015

	(1) Primary educ.	(2) Secondary educ.	(3) Tertiary educ.	(4) Male	(5) Female	(6) 18-30 years	(7) 31-50 years	(8) 51-65 years
	β / SE	β / SE	β / SE	β / SE	β / SE	β / SE	β / SE	β / SE
2000*Ring 1	-1.376	19.933	-85.887	5.647	-4.673	-72.448	8.087	88.541***
	(24.017)	(38.902)	(77.449)	(27.064)	(25.802)	(47.602)	(28.738)	(29.282)
2000*Ring 2	25.377	44.048	-88.969	42.306	-10.187	-91.824*	47.788*	112.863***
	(22.754)	(37.500)	(72.049)	(27.139)	(25.642)	(47.845)	(27.906)	(29.807)
2000*Ring 3	12.437	39.580	-56.625	48.496*	-24.869	-72.306	13.336	91.086***
	(22.441)	(39.727)	(70.945)	(25.186)	(25.673)	(52.918)	(28.562)	(28.518)
2000*Ring 4	-15.178	-14.182	-35.045	-12.384	-15.094	-104.067**	5.906	45.635
	(21.851)	(39.878)	(95.020)	(26.449)	(25.732)	(47.732)	(28.662)	(30.316)
2000*Ring 5	-27.157	-22.483	-59.830	-31.190	-3.963	-37.971	-15.926	-11.063
	(21.228)	(41.892)	(79.339)	(27.458)	(25.117)	(51.073)	(29.931)	(29.514)
2000*Ring 6	-16.566	-0.750	-77.628	-0.180	-15.246	2.399	12.357	-35.309
	(20.675)	(42.029)	(71.339)	(25.677)	(25.251)	(52.809)	(28.355)	(28.166)
2001*Ring 1	-7.238	-7.970	-58.960	-3.071	-24.514	-59.092	-5.210	53.442**
	(21.561)	(34.497)	(76.265)	(24.466)	(23.514)	(46.344)	(26.156)	(25.906)
2001*Ring 2	13.829	-21.655	-39.569	12.703	-20.570	-83.545*	34.952	50.091**
	(20.016)	(33.013)	(73.890)	(25.372)	(23.552)	(42.871)	(26.379)	(25.328)
2001*Ring 3	-16.134	5.069	-55.836	18.700	-45.223*	-88.776**	-9.138	41.501
	(20.677)	(34.021)	(68.791)	(22.631)	(23.924)	(45.178)	(26.508)	(25.877)
2001*Ring 4	-9.895	-36.881	48.289	-8.768	-13.470	-63.967	7.995	15.505
	(19.745)	(36.814)	(83.668)	(23.514)	(23.231)	(42.634)	(26.038)	(26.002)
2001*Ring 5	-37.159*	-59.172	-18.101	-49.886*	-16.612	-59.102	-24.621	-23.700
	(19.915)	(37.972)	(76.988)	(26.301)	(22.355)	(44.934)	(27.444)	(27.051)
2001*Ring 6	-26.661	-22.468	-72.128	-20.519	-21.799	3.303	5.237	-51.935**
	(18.756)	(36.003)	(73.589)	(23.186)	(23.021)	(47.092)	(26.620)	(24.795)
2002*Ring 1	-43.988***	-11.697	-36.543	-54.742***	-16.663	-93.807**	-26.325	9.966
	(14.955)	(27.923)	(58.846)	(19.812)	(18.123)	(39.313)	(22.668)	(18.143)
2002*Ring 2	-6.750	0.865	-31.196	-18.279	-2.159	-84.535**	8.456	36.290**
	(14.739)	(25.530)	(58.601)	(18.806)	(18.284)	(38.519)	(21.344)	(18.157)
2002*Ring 3	-31.991**	21.312	-8.158	-10.921	-21.233	-54.265	-19.759	19.944
	(15.736)	(27.820)	(55.618)	(18.782)	(18.180)	(38.487)	(20.651)	(17.917)
2002*Ring 4	-36.771**	-30.364	13.277	-56.191***	-5.693	-96.710**	-19.802	-0.771
	(14.479)	(29.182)	(62.100)	(18.695)	(18.724)	(37.789)	(20.712)	(18.615)
2002*Ring 5	-40.979***	-56.704**	-37.380	-61.609***	-19.583	-72.659*	-34.178*	-31.050
	(15.082)	(28.700)	(58.074)	(19.280)	(18.235)	(39.162)	(20.688)	(19.144)
2002*Ring 6	-44.725***	4.245	1.204	-39.491**	-16.981	-55.347	0.058	-42.530**
	(14.610)	(28.681)	(59.091)	(18.943)	(17.404)	(39.123)	(20.775)	(18.398)
2004*Ring 1	75.266***	98.450***	106.670**	121.840***	38.214**	24.292	91.412***	73.626***
	(16.774)	(28.649)	(53.095)	(20.031)	(17.158)	(36.114)	(19.083)	(19.746)
2004*Ring 2	67.109***	39.813	94.590	89.750***	25.220	6.239	75.790***	45.967**
	(15.059)	(27.815)	(63.473)	(21.193)	(18.148)	(38.119)	(19.381)	(21.194)

2004*Ring 3	73.467***	65.431**	103.406*	98.073***	37.053**	8.351	89.149***	45.247**
	(15.123)	(27.550)	(53.114)	(19.442)	(17.092)	(40.440)	(18.410)	(19.955)
2004*Ring 4	83.231***	74.459***	50.979	94.777***	51.547***	51.601	88.301***	67.207***
	(15.543)	(28.471)	(51.409)	(20.387)	(18.148)	(36.483)	(20.237)	(19.465)
2004*Ring 5	11.828	-2.450	-31.384	-17.965	27.345	7.491	-0.240	13.753
	(16.523)	(30.872)	(60.883)	(22.681)	(18.084)	(42.886)	(20.965)	(20.799)
2004*Ring 6	-6.041	10.258	-24.748	-17.860	8.103	-10.608	11.587	-18.323
	(16.281)	(29.198)	(57.628)	(21.250)	(18.199)	(42.423)	(20.446)	(19.528)
2005*Ring 1	124.630***	152.910***	269.605***	212.345***	62.893***	51.768	164.211***	107.378***
	(21.412)	(34.743)	(89.668)	(28.228)	(22.130)	(43.654)	(28.585)	(27.481)
2005*Ring 2	128.247***	97.627***	78.742	168.636***	43.601**	64.963	128.545***	78.817***
	(18.240)	(31.930)	(68.721)	(21.848)	(20.157)	(41.808)	(23.813)	(26.302)
2005*Ring 3	128.378***	137.696***	150.888***	182.517***	70.594***	36.859	156.421***	83.215***
	(19.075)	(33.218)	(58.101)	(22.151)	(21.701)	(44.582)	(23.949)	(26.855)
2005*Ring 4	138.695***	141.835***	124.484**	189.447***	76.763***	89.354**	152.476***	102.164***
	(19.072)	(35.975)	(59.976)	(23.953)	(21.113)	(42.948)	(25.694)	(25.331)
2005*Ring 5	25.848	30.492	12.527	6.743	30.943	-16.705	19.769	23.691
	(20.335)	(37.231)	(68.009)	(26.969)	(21.517)	(52.786)	(25.687)	(27.642)
2005*Ring 6	16.177	50.357	-84.369	15.548	5.882	0.865	12.383	14.207
	(18.725)	(34.393)	(68.607)	(24.118)	(21.661)	(49.469)	(25.136)	(25.430)
2006*Ring 1	153.427***	190.378***	343.762***	269.121***	71.132***	149.397***	192.024***	106.817***
	(23.851)	(35.169)	(99.799)	(27.452)	(23.824)	(50.950)	(28.115)	(31.099)
2006*Ring 2	165.694***	159.799***	133.475	247.185***	49.328**	166.084***	191.411***	66.826**
	(22.109)	(34.935)	(92.329)	(27.709)	(23.936)	(53.519)	(29.049)	(31.697)
2006*Ring 3	169.836***	170.851***	167.415**	241.860***	61.086***	133.740**	178.865***	79.280***
	(22.483)	(35.393)	(80.925)	(28.111)	(22.807)	(59.831)	(28.145)	(30.444)
2006*Ring 4	157.369***	177.706***	175.511**	233.864***	76.058***	127.524**	181.520***	100.801***
	(23.937)	(36.701)	(88.622)	(27.627)	(23.346)	(54.395)	(31.942)	(30.865)
2006*Ring 5	8.016	45.960	46.449	8.673	14.129	-11.128	28.516	0.924
	(22.990)	(40.115)	(85.193)	(29.822)	(24.308)	(62.796)	(29.668)	(29.234)
2006*Ring 6	14.015	72.248**	10.242	33.913	6.819	84.902	34.762	9.070
	(21.798)	(36.793)	(84.145)	(27.894)	(23.384)	(60.324)	(29.406)	(28.087)
2007*Ring 1	187.044***	206.770***	403.241***	353.630***	34.016	165.493***	196.164***	134.169***
	(25.719)	(39.339)	(106.307)	(28.331)	(25.790)	(57.412)	(30.815)	(33.120)
2007*Ring 2	202.188***	191.014***	264.581***	327.078***	51.032**	199.847***	205.281***	95.290***
	(24.823)	(40.443)	(97.342)	(31.325)	(25.959)	(57.723)	(32.142)	(35.671)
2007*Ring 3	210.395***	199.582***	167.777*	324.956***	42.766*	122.145**	200.495***	112.162***
	(24.199)	(38.431)	(89.224)	(29.189)	(25.398)	(61.202)	(30.635)	(34.934)
2007*Ring 4	156.433***	187.430***	231.693**	291.904***	34.439	106.329*	170.295***	111.879***
	(25.363)	(41.516)	(96.109)	(29.825)	(24.531)	(57.230)	(35.364)	(33.768)
2007*Ring 5	39.523	34.797	70.672	62.811**	-14.318	-16.736	50.111	11.454
	(24.457)	(45.804)	(96.712)	(31.814)	(26.337)	(70.251)	(31.618)	(32.667)
2007*Ring 6	13.047	66.673	3.109	65.667**	-39.184	42.473	26.050	8.938
	(23.311)	(41.801)	(92.336)	(29.300)	(25.573)	(66.723)	(31.740)	(31.062)
2008*Ring 1	199.541***	233.994***	497.049***	359.459***	78.493***	196.099***	222.181***	116.311***
	(25.938)	(46.109)	(119.438)	(30.102)	(27.040)	(64.186)	(34.793)	(34.547)

2008*Ring 2	218.226***	223.109***	308.210***	357.703***	73.297***	227.601***	236.704***	97.416***
	(24.499)	(44.238)	(99.318)	(31.226)	(26.953)	(62.708)	(35.579)	(36.692)
2008*Ring 3	220.766***	217.258***	223.537**	325.198***	76.005***	160.349**	217.297***	84.644**
	(25.889)	(43.193)	(92.019)	(28.744)	(26.943)	(63.501)	(33.963)	(36.982)
2008*Ring 4	166.294***	222.375***	275.234***	283.653***	79.569***	147.801**	193.847***	91.847**
	(26.995)	(44.300)	(99.478)	(31.072)	(27.364)	(61.492)	(37.988)	(36.992)
2008*Ring 5	21.902	55.735	111.638	41.967	6.482	-24.639	27.565	16.857
	(25.473)	(50.821)	(99.558)	(33.673)	(27.432)	(77.402)	(34.504)	(35.580)
2008*Ring 6	12.191	70.198	24.472	50.952	-20.620	16.631	28.464	6.434
	(24.152)	(46.398)	(97.534)	(31.274)	(26.902)	(74.711)	(35.593)	(33.568)
2009*Ring 1	200.509***	249.664***	440.823***	368.974***	87.741***	190.720***	262.699***	91.628**
	(31.722)	(45.975)	(124.515)	(34.313)	(31.399)	(61.366)	(38.072)	(39.933)
2009*Ring 2	226.773***	194.171***	286.749***	355.705***	77.986***	173.095***	273.162***	85.273**
	(28.940)	(44.012)	(98.609)	(35.536)	(27.526)	(63.929)	(38.359)	(39.289)
2009*Ring 3	245.928***	228.308***	202.496**	351.493***	98.820***	135.652**	272.605***	75.587*
	(27.408)	(44.460)	(92.898)	(32.524)	(29.960)	(66.016)	(36.209)	(41.482)
2009*Ring 4	209.264***	197.974***	222.038**	315.280***	85.614***	153.832**	235.680***	89.429**
	(29.496)	(44.686)	(102.835)	(33.800)	(29.192)	(61.800)	(39.140)	(40.522)
2009*Ring 5	44.449	29.525	75.562	69.169*	-5.850	-15.697	68.302*	0.825
	(30.339)	(50.029)	(102.373)	(37.120)	(31.294)	(77.461)	(37.262)	(38.779)
2009*Ring 6	24.467	79.497*	-29.545	71.011**	-14.354	25.497	57.984	5.126
	(28.172)	(45.636)	(97.590)	(34.849)	(29.863)	(78.759)	(37.504)	(36.640)
2010*Ring 1	306.888***	411.370***	494.320***	536.699***	169.186***	398.947***	352.248***	196.198***
	(33.661)	(52.724)	(148.816)	(42.657)	(33.611)	(70.071)	(45.010)	(42.553)
2010*Ring 2	310.676***	345.072***	292.798***	512.704***	131.512***	337.583***	376.200***	136.118***
	(31.338)	(46.438)	(108.654)	(37.125)	(32.389)	(67.129)	(43.603)	(39.386)
2010*Ring 3	332.648***	343.018***	239.938**	464.440***	182.608***	268.215***	377.975***	121.675***
	(32.028)	(48.556)	(102.741)	(35.045)	(32.158)	(72.915)	(41.215)	(44.581)
2010*Ring 4	281.330***	329.665***	238.712**	433.977***	145.969***	328.631***	315.063***	129.886***
	(34.925)	(50.249)	(119.784)	(38.645)	(30.565)	(68.215)	(44.563)	(43.149)
2010*Ring 5	72.243**	66.023	62.226	107.259***	14.810	81.711	76.846*	29.024
	(32.230)	(55.327)	(113.700)	(40.483)	(32.777)	(92.567)	(43.126)	(39.989)
2010*Ring 6	11.289	114.479**	-43.192	75.975**	-6.039	103.384	57.807	0.257
	(30.530)	(50.201)	(109.863)	(37.752)	(31.466)	(84.390)	(42.593)	(38.507)
2011*Ring 1	322.606***	449.133***	543.547***	567.902***	213.942***	470.134***	396.674***	149.245***
	(35.425)	(51.934)	(165.568)	(39.938)	(37.234)	(71.795)	(46.910)	(45.084)
2011*Ring 2	351.100***	377.868***	376.885***	540.457***	208.414***	432.462***	439.591***	109.066**
	(32.873)	(49.203)	(114.269)	(39.409)	(32.911)	(73.005)	(41.475)	(44.644)
2011*Ring 3	342.345***	340.504***	311.420***	473.890***	209.985***	344.508***	395.579***	75.217*
	(33.474)	(50.233)	(113.617)	(39.050)	(33.955)	(78.033)	(42.323)	(45.656)
2011*Ring 4	288.189***	349.353***	258.641**	438.419***	184.662***	370.959***	378.121***	83.046*
	(37.029)	(53.238)	(124.815)	(42.661)	(32.688)	(73.419)	(43.441)	(49.381)
2011*Ring 5	92.734***	88.832	107.416	122.877***	47.076	118.881	102.300**	26.482
	(33.477)	(55.012)	(120.047)	(41.733)	(33.473)	(91.799)	(43.495)	(44.128)
2011*Ring 6	8.345	78.696	-57.947	37.672	8.255	120.560	74.655*	-42.177
	(32.178)	(53.395)	(117.576)	(40.616)	(33.956)	(90.142)	(44.021)	(41.826)

2012*Ring 1	377.646***	433.640***	672.897***	622.799***	218.554***	439.268***	464.512***	138.003***
	(39.292)	(56.022)	(177.389)	(43.429)	(40.978)	(79.333)	(53.801)	(47.704)
2012*Ring 2	366.271***	362.234***	446.369***	551.271***	214.115***	389.941***	464.905***	93.712**
	(34.659)	(52.618)	(117.125)	(42.880)	(37.564)	(82.216)	(45.653)	(47.428)
2012*Ring 3	406.813***	356.606***	394.560***	547.675***	225.381***	323.914***	483.488***	73.742
	(35.374)	(52.005)	(116.824)	(41.500)	(37.143)	(85.379)	(46.629)	(47.714)
2012*Ring 4	306.978***	366.307***	358.922***	472.854***	195.432***	352.852***	398.121***	98.883*
	(40.461)	(54.306)	(133.933)	(45.824)	(38.584)	(81.758)	(50.973)	(50.553)
2012*Ring 5	87.379**	72.743	141.756	133.476***	15.457	41.062	119.281**	14.804
	(36.699)	(58.024)	(132.816)	(46.239)	(38.047)	(102.145)	(47.585)	(48.277)
2012*Ring 6	31.999	82.356	-13.444	73.900*	-4.465	95.269	118.456**	-25.372
	(35.569)	(56.599)	(125.209)	(43.599)	(38.588)	(101.544)	(49.813)	(45.477)
2013*Ring 1	418.015***	485.219***	637.554***	708.824***	223.969***	487.738***	478.540***	164.454***
	(39.986)	(57.650)	(198.811)	(46.426)	(42.209)	(86.593)	(59.921)	(52.084)
2013*Ring 2	405.682***	405.242***	506.630***	630.944***	236.329***	433.955***	487.133***	142.612***
	(38.760)	(56.312)	(133.799)	(46.992)	(39.200)	(86.668)	(50.781)	(54.630)
2013*Ring 3	460.582***	412.587***	512.183***	635.378***	281.077***	373.579***	527.834***	125.229**
	(37.597)	(55.872)	(135.066)	(43.130)	(38.450)	(91.265)	(50.317)	(52.536)
2013*Ring 4	343.471***	403.516***	353.445**	541.710***	210.309***	380.019***	409.541***	118.383**
	(42.401)	(58.044)	(148.724)	(48.003)	(39.436)	(86.305)	(57.182)	(55.439)
2013*Ring 5	114.365***	71.231	231.853	166.255***	40.496	91.948	120.920**	36.882
	(39.540)	(64.958)	(154.197)	(50.931)	(39.644)	(107.855)	(53.533)	(53.468)
2013*Ring 6	52.536	68.524	86.251	106.483**	21.268	114.123	146.114***	-9.801
	(37.960)	(60.498)	(140.875)	(47.674)	(39.640)	(104.826)	(54.170)	(48.712)
2014*Ring 1	413.165***	464.691***	697.057***	693.383***	263.599***	548.169***	443.146***	152.790***
	(42.404)	(62.979)	(208.119)	(50.441)	(45.701)	(88.062)	(66.756)	(54.620)
2014*Ring 2	412.465***	372.460***	508.552***	602.560***	279.820***	496.993***	483.929***	94.987*
	(39.653)	(60.045)	(142.420)	(47.478)	(40.092)	(87.559)	(55.932)	(55.548)
2014*Ring 3	466.559***	387.329***	536.917***	638.686***	311.890***	441.578***	522.179***	103.681**
	(40.550)	(59.260)	(144.243)	(48.521)	(43.315)	(91.045)	(57.078)	(52.377)
2014*Ring 4	382.149***	367.141***	295.071*	533.108***	247.328***	436.150***	369.815***	115.337*
	(43.789)	(60.674)	(163.011)	(51.492)	(41.914)	(87.497)	(62.489)	(60.226)
2014*Ring 5	151.985***	55.635	180.682	182.077***	67.857	130.806	120.579**	49.666
	(42.717)	(68.957)	(157.722)	(55.571)	(43.984)	(111.102)	(59.518)	(55.117)
2014*Ring 6	75.663*	74.483	110.148	125.141**	54.111	218.455**	134.323**	9.875
	(39.997)	(62.938)	(150.038)	(51.250)	(41.762)	(107.588)	(60.036)	(50.408)
2015*Ring 1	431.948***	467.552***	657.294***	707.781***	276.655***	559.920***	363.560***	197.664***
	(44.094)	(63.363)	(213.054)	(55.364)	(46.853)	(90.236)	(68.567)	(56.400)
2015*Ring 2	397.838***	382.702***	482.528***	597.367***	285.659***	489.283***	380.006***	137.972**
	(42.218)	(63.046)	(151.448)	(55.035)	(42.987)	(90.347)	(60.127)	(56.680)
2015*Ring 3	471.603***	379.395***	566.778***	626.855***	340.784***	385.304***	478.422***	149.283***
	(41.677)	(61.454)	(156.872)	(53.233)	(44.075)	(91.562)	(59.622)	(54.596)
2015*Ring 4	364.968***	380.589***	380.684**	548.096***	256.242***	423.203***	297.703***	166.866***
	(43.400)	(64.484)	(171.812)	(55.119)	(44.229)	(89.968)	(66.042)	(63.943)
2015*Ring 5	129.627***	56.475	263.231	152.742**	99.244**	121.917	61.601	84.038
	(44.855)	(71.855)	(171.596)	(59.668)	(44.870)	(114.565)	(61.291)	(57.330)

2015*Ring 6	45.646	25.535	59.541	90.253	26.445	160.465	51.652	11.917
	(42.233)	(66.059)	(163.632)	(56.599)	(43.985)	(111.848)	(62.161)	(53.725)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Individual FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Grid FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Nxt	294003	178252	50708	280867	242096	95039	219578	208346
N	18375	11141	3169	17554	15131	5940	13724	13022
Mean dep. var	1617	2016	2593	2067	1556	1451	2113	1701
R-squared	0.843	0.790	0.829	0.825	0.812	0.792	0.841	0.883
Within R-squared	0.283	0.254	0.219	0.284	0.306	0.274	0.167	0.306

Notes: Two-way fixed effects panel data regression. Yearly earnings (in 100 SEK) are deflated to 2000 values via the national CPI. Yearly earnings are analyzed in 100 Swedish krona values (in 100 SEK). Ring 1: 0.00 km-3.16 km, ring 2: 3.17 km-3.82 km, ring 3: 3.83 km-4.61 km, ring 4: 4.62 km-26.68 km, ring 5: 26.69 km-82.84 km, ring 6: 82.85 km-131.33 km, and ring 7: 131.34 km-150.00 km. Ring 7 is the reference group. All the estimations include marital status, having children under 18 years old, educational levels, and economic sectors as controls, as well as individual, grid, and time fixed effects. Standard errors (in parentheses) are clustered at the grid level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.7: Impact of the mining boom on employment, 2000-2015

	(1) Employment Residents	(2) Mining sect.	(3) Agricultural sect.	(4) Manufacturing sect.	(5) Construction sect.	(6) Service sect.	(7) Public sect.	(8) Other sect.
	β / SE	β / SE	β / SE	β / SE	β / SE	β / SE	β / SE	β / SE
2000*Ring 1	-0.017	0.001	-0.000	-0.004	-0.009**	0.016*	0.024**	-0.044***
	(0.011)	(0.004)	(0.003)	(0.005)	(0.005)	(0.009)	(0.009)	(0.008)
2000*Ring 2	0.000	0.004	-0.001	-0.007	-0.006	0.016*	0.023**	-0.029***
	(0.010)	(0.003)	(0.003)	(0.005)	(0.004)	(0.009)	(0.009)	(0.007)
2000*Ring 3	-0.021*	0.000	0.001	-0.003	-0.004	-0.004	0.014	-0.025***
	(0.011)	(0.003)	(0.003)	(0.005)	(0.005)	(0.009)	(0.009)	(0.007)
2000*Ring 4	-0.006	-0.006*	-0.002	-0.003	-0.001	0.005	0.032***	-0.031***
	(0.011)	(0.003)	(0.003)	(0.006)	(0.005)	(0.009)	(0.009)	(0.007)
2000*Ring 5	-0.030***	-0.005***	-0.010**	-0.008	0.002	0.009	0.023**	-0.042***
	(0.011)	(0.002)	(0.004)	(0.005)	(0.005)	(0.008)	(0.009)	(0.007)
2000*Ring 6	-0.017	-0.001	-0.002	-0.007	-0.005	-0.003	-0.007	0.007
	(0.011)	(0.001)	(0.004)	(0.006)	(0.004)	(0.008)	(0.009)	(0.007)
2001*Ring 1	-0.007	-0.002	0.002	-0.009*	-0.002	0.016**	0.021**	-0.032***
	(0.010)	(0.004)	(0.003)	(0.005)	(0.004)	(0.008)	(0.008)	(0.008)
2001*Ring 2	-0.003	0.001	0.000	-0.017***	-0.002	0.009	0.032***	-0.027***
	(0.009)	(0.002)	(0.003)	(0.005)	(0.004)	(0.008)	(0.008)	(0.006)
2001*Ring 3	-0.007	-0.000	0.001	-0.005	0.001	0.002	0.018**	-0.023***
	(0.010)	(0.003)	(0.003)	(0.005)	(0.004)	(0.009)	(0.008)	(0.007)
2001*Ring 4	-0.003	-0.005	0.000	-0.011**	-0.001	0.007	0.033***	-0.028***
	(0.010)	(0.003)	(0.003)	(0.005)	(0.004)	(0.009)	(0.008)	(0.007)
2001*Ring 5	-0.017*	-0.003*	-0.005	-0.011**	0.006	0.011	0.020**	-0.035***
	(0.010)	(0.002)	(0.004)	(0.005)	(0.005)	(0.008)	(0.009)	(0.007)
2001*Ring 6	-0.010	-0.002*	-0.000	-0.007	-0.002	0.005	-0.009	0.004
	(0.010)	(0.001)	(0.004)	(0.005)	(0.004)	(0.008)	(0.009)	(0.007)
2002*Ring 1	0.007	0.004	0.001	0.001	-0.002	-0.003	0.002	0.003
	(0.008)	(0.003)	(0.003)	(0.004)	(0.003)	(0.006)	(0.006)	(0.005)
2002*Ring 2	0.010	0.004**	0.000	-0.000	-0.001	-0.003	0.005	0.006
	(0.008)	(0.002)	(0.002)	(0.004)	(0.003)	(0.007)	(0.007)	(0.004)
2002*Ring 3	-0.000	0.002	0.000	0.000	-0.000	-0.010	-0.002	0.008*
	(0.008)	(0.002)	(0.002)	(0.004)	(0.003)	(0.007)	(0.006)	(0.004)
2002*Ring 4	0.007	0.001	-0.000	0.001	0.000	-0.001	-0.001	0.007
	(0.008)	(0.003)	(0.003)	(0.004)	(0.003)	(0.007)	(0.006)	(0.005)
2002*Ring 5	-0.005	-0.003**	0.000	0.001	0.009**	-0.000	-0.006	-0.006
	(0.008)	(0.001)	(0.003)	(0.004)	(0.004)	(0.006)	(0.006)	(0.005)
2002*Ring 6	-0.003	-0.001	0.002	-0.001	0.004	-0.001	-0.007	0.001
	(0.008)	(0.001)	(0.003)	(0.004)	(0.004)	(0.006)	(0.006)	(0.005)
2004*Ring 1	-0.011	0.006***	-0.004	0.006	-0.003	-0.000	-0.009	-0.006
	(0.008)	(0.002)	(0.003)	(0.004)	(0.003)	(0.006)	(0.006)	(0.005)
2004*Ring 2	-0.005	0.002	-0.004	0.006	-0.002	0.004	0.002	-0.012**
	(0.008)	(0.003)	(0.003)	(0.004)	(0.003)	(0.006)	(0.006)	(0.005)
2004*Ring 3	-0.018**	0.004*	-0.003	0.000	-0.003	0.006	-0.010*	-0.012***

	(0.008)	(0.002)	(0.003)	(0.004)	(0.004)	(0.006)	(0.006)	(0.005)
2004*Ring 4	0.008	0.001	-0.002	0.009*	0.001	0.006	-0.002	-0.005
	(0.009)	(0.003)	(0.003)	(0.004)	(0.003)	(0.006)	(0.006)	(0.005)
2004*Ring 5	0.032***	-0.002	0.006	0.006	0.002	0.014**	0.004	0.001
	(0.009)	(0.002)	(0.004)	(0.004)	(0.003)	(0.006)	(0.006)	(0.005)
2004*Ring 6	0.020**	-0.000	0.009**	0.004	0.002	-0.003	0.010	-0.001
	(0.009)	(0.001)	(0.004)	(0.004)	(0.003)	(0.006)	(0.006)	(0.005)
2005*Ring 1	-0.011	0.012***	-0.009**	0.006	-0.004	-0.007	-0.009	-0.000
	(0.009)	(0.004)	(0.004)	(0.005)	(0.004)	(0.007)	(0.008)	(0.005)
2005*Ring 2	0.004	0.009***	-0.010**	0.008*	-0.002	0.001	0.001	-0.003
	(0.010)	(0.003)	(0.004)	(0.005)	(0.005)	(0.008)	(0.008)	(0.005)
2005*Ring 3	-0.014	0.006**	-0.009**	0.002	-0.005	0.003	-0.008	-0.004
	(0.009)	(0.003)	(0.004)	(0.005)	(0.004)	(0.007)	(0.007)	(0.005)
2005*Ring 4	0.012	0.004	-0.008*	0.009*	0.002	0.000	0.003	0.001
	(0.010)	(0.004)	(0.004)	(0.005)	(0.004)	(0.007)	(0.007)	(0.005)
2005*Ring 5	0.037***	0.001	0.013**	0.004	0.002	0.011	0.003	0.004
	(0.010)	(0.002)	(0.006)	(0.005)	(0.005)	(0.007)	(0.008)	(0.005)
2005*Ring 6	0.025**	0.001	0.010*	0.003	0.002	-0.004	0.008	0.005
	(0.011)	(0.001)	(0.005)	(0.005)	(0.004)	(0.007)	(0.008)	(0.005)
2006*Ring 1	0.008	0.022***	-0.001	0.010*	-0.003	-0.005	-0.014	-0.000
	(0.011)	(0.004)	(0.004)	(0.006)	(0.005)	(0.008)	(0.009)	(0.006)
2006*Ring 2	0.017	0.016***	-0.002	0.009*	-0.007	0.004	0.003	-0.006
	(0.012)	(0.003)	(0.004)	(0.005)	(0.005)	(0.009)	(0.009)	(0.006)
2006*Ring 3	-0.008	0.010***	0.000	0.009*	-0.004	-0.003	-0.012	-0.008
	(0.010)	(0.003)	(0.004)	(0.005)	(0.005)	(0.008)	(0.008)	(0.006)
2006*Ring 4	0.009	0.006	0.002	0.013**	-0.001	-0.001	-0.006	-0.002
	(0.012)	(0.004)	(0.004)	(0.006)	(0.005)	(0.009)	(0.009)	(0.006)
2006*Ring 5	0.036***	0.002	0.016***	0.006	0.000	0.012	-0.008	0.009
	(0.012)	(0.002)	(0.006)	(0.006)	(0.005)	(0.008)	(0.009)	(0.006)
2006*Ring 6	0.035***	0.002	0.017***	0.013**	0.001	-0.012	0.006	0.009
	(0.012)	(0.001)	(0.005)	(0.006)	(0.005)	(0.008)	(0.009)	(0.006)
2007*Ring 1	-0.001	0.030***	-0.011***	-0.001	0.002	-0.012	0.026**	-0.035***
	(0.011)	(0.005)	(0.004)	(0.006)	(0.005)	(0.010)	(0.010)	(0.010)
2007*Ring 2	0.010	0.026***	-0.012***	0.004	-0.005	-0.000	0.036***	-0.037***
	(0.012)	(0.005)	(0.004)	(0.006)	(0.005)	(0.011)	(0.010)	(0.010)
2007*Ring 3	-0.014	0.021***	-0.010**	0.002	-0.007	-0.007	0.034***	-0.047***
	(0.011)	(0.004)	(0.004)	(0.006)	(0.005)	(0.010)	(0.010)	(0.010)
2007*Ring 4	-0.006	0.013***	-0.010**	0.006	-0.000	-0.010	0.027***	-0.031***
	(0.012)	(0.004)	(0.004)	(0.006)	(0.005)	(0.010)	(0.010)	(0.010)
2007*Ring 5	0.034***	0.005**	0.009*	0.003	0.005	0.011	-0.012	0.013
	(0.012)	(0.002)	(0.005)	(0.006)	(0.006)	(0.010)	(0.010)	(0.010)
2007*Ring 6	0.045***	0.004**	0.015***	0.008	0.007	-0.015	-0.005	0.032***
	(0.012)	(0.001)	(0.005)	(0.007)	(0.006)	(0.010)	(0.010)	(0.010)
2008*Ring 1	0.019	0.040***	-0.009**	0.015**	-0.008	-0.016*	0.025**	-0.027***
	(0.012)	(0.006)	(0.004)	(0.007)	(0.006)	(0.010)	(0.011)	(0.010)
2008*Ring 2	0.026*	0.024***	-0.009**	0.011	-0.014**	0.008	0.030***	-0.024**

	(0.013)	(0.005)	(0.004)	(0.007)	(0.006)	(0.012)	(0.010)	(0.010)
2008*Ring 3	-0.002	0.023***	-0.009**	0.013*	-0.011*	-0.005	0.032***	-0.044***
	(0.012)	(0.005)	(0.004)	(0.007)	(0.006)	(0.010)	(0.010)	(0.010)
2008*Ring 4	0.015	0.015***	-0.006	0.019***	-0.003	-0.005	0.024**	-0.029***
	(0.013)	(0.005)	(0.004)	(0.007)	(0.006)	(0.010)	(0.010)	(0.010)
2008*Ring 5	0.047***	0.007**	0.013**	0.008	0.005	0.020*	-0.010	0.005
	(0.013)	(0.003)	(0.006)	(0.008)	(0.007)	(0.010)	(0.010)	(0.010)
2008*Ring 6	0.046***	0.003*	0.016***	0.014*	0.004	-0.003	-0.013	0.026**
	(0.013)	(0.002)	(0.006)	(0.008)	(0.006)	(0.010)	(0.011)	(0.010)
2009*Ring 1	0.019	0.035***	-0.013***	0.016**	-0.003	-0.026**	0.036***	-0.025**
	(0.012)	(0.005)	(0.005)	(0.007)	(0.006)	(0.011)	(0.011)	(0.010)
2009*Ring 2	0.024*	0.020***	-0.012**	0.012*	-0.005	-0.004	0.041***	-0.028***
	(0.013)	(0.004)	(0.005)	(0.007)	(0.006)	(0.012)	(0.010)	(0.010)
2009*Ring 3	0.001	0.017***	-0.014***	0.012*	-0.005	-0.013	0.041***	-0.039***
	(0.011)	(0.005)	(0.005)	(0.007)	(0.006)	(0.010)	(0.010)	(0.010)
2009*Ring 4	0.017	0.019***	-0.010**	0.013*	0.003	-0.023**	0.033***	-0.019**
	(0.014)	(0.004)	(0.005)	(0.007)	(0.006)	(0.011)	(0.010)	(0.010)
2009*Ring 5	0.052***	0.004	0.010	0.012	0.016**	0.002	-0.001	0.009
	(0.013)	(0.003)	(0.007)	(0.008)	(0.007)	(0.011)	(0.010)	(0.010)
2009*Ring 6	0.044***	0.002	0.012*	0.016**	0.003	-0.011	-0.008	0.030***
	(0.013)	(0.002)	(0.006)	(0.008)	(0.006)	(0.011)	(0.010)	(0.011)
2010*Ring 1	0.029**	0.046***	-0.013***	0.023***	-0.004	-0.030***	0.035***	-0.027**
	(0.014)	(0.006)	(0.005)	(0.007)	(0.006)	(0.012)	(0.011)	(0.012)
2010*Ring 2	0.041***	0.031***	-0.012**	0.018**	-0.006	-0.003	0.038***	-0.025**
	(0.014)	(0.005)	(0.005)	(0.007)	(0.007)	(0.013)	(0.010)	(0.011)
2010*Ring 3	0.012	0.029***	-0.012**	0.024***	-0.005	-0.025**	0.039***	-0.038***
	(0.013)	(0.006)	(0.005)	(0.007)	(0.007)	(0.011)	(0.010)	(0.011)
2010*Ring 4	0.025*	0.027***	-0.008	0.023***	0.007	-0.031***	0.034***	-0.026**
	(0.014)	(0.005)	(0.005)	(0.007)	(0.007)	(0.012)	(0.010)	(0.011)
2010*Ring 5	0.062***	0.010***	0.012*	0.023***	0.017**	-0.007	-0.002	0.008
	(0.014)	(0.003)	(0.007)	(0.008)	(0.007)	(0.012)	(0.011)	(0.011)
2010*Ring 6	0.057***	0.008***	0.016**	0.022***	0.006	-0.016	-0.010	0.031***
	(0.015)	(0.002)	(0.007)	(0.008)	(0.007)	(0.012)	(0.011)	(0.012)
2011*Ring 1	0.031**	0.050***	-0.016***	0.032***	-0.016**	-0.025**	0.034***	-0.030**
	(0.014)	(0.006)	(0.005)	(0.008)	(0.008)	(0.011)	(0.012)	(0.013)
2011*Ring 2	0.042***	0.034***	-0.016***	0.020***	-0.016**	0.007	0.037***	-0.024**
	(0.015)	(0.006)	(0.005)	(0.007)	(0.008)	(0.013)	(0.010)	(0.012)
2011*Ring 3	0.012	0.038***	-0.014***	0.029***	-0.016**	-0.018*	0.031***	-0.036***
	(0.014)	(0.006)	(0.005)	(0.007)	(0.008)	(0.011)	(0.010)	(0.011)
2011*Ring 4	0.019	0.033***	-0.011**	0.026***	-0.003	-0.027**	0.034***	-0.032***
	(0.015)	(0.005)	(0.005)	(0.007)	(0.008)	(0.011)	(0.010)	(0.011)
2011*Ring 5	0.047***	0.012***	0.003	0.029***	0.006	-0.006	-0.004	0.007
	(0.015)	(0.004)	(0.007)	(0.008)	(0.008)	(0.011)	(0.011)	(0.012)
2011*Ring 6	0.058***	0.008***	0.017**	0.026***	0.002	-0.007	-0.010	0.022*
	(0.016)	(0.003)	(0.007)	(0.008)	(0.008)	(0.012)	(0.011)	(0.012)
2012*Ring 1	0.025*	0.061***	-0.015***	0.033***	-0.020***	-0.031***	0.028**	-0.030***

	(0.014)	(0.006)	(0.005)	(0.008)	(0.007)	(0.011)	(0.011)	(0.012)
2012*Ring 2	0.046***	0.035***	-0.014***	0.020***	-0.010	-0.003	0.039***	-0.021*
	(0.015)	(0.006)	(0.005)	(0.008)	(0.008)	(0.013)	(0.010)	(0.011)
2012*Ring 3	0.008	0.048***	-0.014***	0.027***	-0.021***	-0.027**	0.027**	-0.031***
	(0.013)	(0.007)	(0.005)	(0.008)	(0.008)	(0.010)	(0.011)	(0.011)
2012*Ring 4	0.024*	0.040***	-0.009*	0.026***	0.002	-0.040***	0.033***	-0.028**
	(0.014)	(0.005)	(0.005)	(0.008)	(0.008)	(0.012)	(0.010)	(0.011)
2012*Ring 5	0.051***	0.019***	0.004	0.023***	0.008	-0.007	-0.008	0.012
	(0.015)	(0.004)	(0.007)	(0.008)	(0.008)	(0.011)	(0.011)	(0.012)
2012*Ring 6	0.065***	0.017***	0.012*	0.023***	0.002	-0.003	-0.014	0.028**
	(0.015)	(0.003)	(0.007)	(0.009)	(0.008)	(0.012)	(0.011)	(0.012)
2013*Ring 1	0.011	0.063***	-0.015***	0.032***	-0.022***	-0.023**	0.025**	-0.049***
	(0.014)	(0.006)	(0.006)	(0.008)	(0.007)	(0.011)	(0.012)	(0.012)
2013*Ring 2	0.031**	0.036***	-0.014**	0.021***	-0.009	0.004	0.031***	-0.038***
	(0.015)	(0.006)	(0.006)	(0.007)	(0.007)	(0.012)	(0.011)	(0.012)
2013*Ring 3	-0.005	0.056***	-0.013**	0.022***	-0.022***	-0.030***	0.025**	-0.044***
	(0.014)	(0.007)	(0.006)	(0.007)	(0.008)	(0.012)	(0.011)	(0.012)
2013*Ring 4	0.015	0.048***	-0.008	0.024***	0.001	-0.031**	0.024**	-0.042***
	(0.014)	(0.006)	(0.006)	(0.008)	(0.007)	(0.012)	(0.011)	(0.011)
2013*Ring 5	0.046***	0.022***	0.007	0.026***	0.008	-0.007	-0.013	0.002
	(0.014)	(0.005)	(0.007)	(0.008)	(0.008)	(0.012)	(0.012)	(0.012)
2013*Ring 6	0.068***	0.023***	0.015**	0.022**	0.003	0.004	-0.019	0.020
	(0.015)	(0.004)	(0.007)	(0.009)	(0.007)	(0.012)	(0.012)	(0.012)
2014*Ring 1	0.003	0.062***	-0.012**	0.021***	-0.019**	-0.029**	0.025**	-0.046***
	(0.014)	(0.006)	(0.006)	(0.008)	(0.007)	(0.013)	(0.012)	(0.012)
2014*Ring 2	0.028*	0.045***	-0.011*	0.017**	-0.012	-0.005	0.030***	-0.036***
	(0.014)	(0.007)	(0.006)	(0.008)	(0.008)	(0.013)	(0.011)	(0.011)
2014*Ring 3	-0.016	0.058***	-0.011*	0.019**	-0.027***	-0.032**	0.019*	-0.041***
	(0.014)	(0.007)	(0.006)	(0.008)	(0.008)	(0.013)	(0.011)	(0.011)
2014*Ring 4	0.011	0.048***	-0.006	0.022***	0.000	-0.040***	0.021*	-0.035***
	(0.014)	(0.006)	(0.006)	(0.008)	(0.008)	(0.013)	(0.011)	(0.012)
2014*Ring 5	0.043***	0.018***	0.008	0.020**	0.006	-0.006	-0.011	0.008
	(0.015)	(0.005)	(0.008)	(0.009)	(0.008)	(0.012)	(0.011)	(0.012)
2014*Ring 6	0.067***	0.025***	0.011	0.014*	0.001	-0.001	-0.018	0.033***
	(0.015)	(0.004)	(0.008)	(0.009)	(0.008)	(0.013)	(0.012)	(0.012)
2015*Ring 1	0.002	0.068***	-0.010	0.011	-0.026***	-0.017	0.021*	-0.046***
	(0.014)	(0.007)	(0.006)	(0.008)	(0.008)	(0.013)	(0.012)	(0.012)
2015*Ring 2	0.022*	0.049***	-0.009	0.010	-0.023**	0.006	0.030***	-0.040***
	(0.014)	(0.007)	(0.006)	(0.008)	(0.009)	(0.014)	(0.011)	(0.011)
2015*Ring 3	-0.013	0.063***	-0.008	0.012	-0.039***	-0.017	0.019	-0.043***
	(0.014)	(0.007)	(0.006)	(0.008)	(0.009)	(0.012)	(0.012)	(0.011)
2015*Ring 4	0.006	0.055***	-0.003	0.014*	-0.011	-0.029**	0.020*	-0.038***
	(0.014)	(0.006)	(0.006)	(0.008)	(0.009)	(0.013)	(0.012)	(0.011)
2015*Ring 5	0.048***	0.024***	0.015*	0.010	0.003	-0.001	-0.008	0.005
	(0.014)	(0.005)	(0.008)	(0.009)	(0.009)	(0.012)	(0.012)	(0.012)
2015*Ring 6	0.054***	0.011***	0.015*	0.012	0.001	-0.008	-0.017	0.040***

	(0.015)	(0.003)	(0.008)	(0.009)	(0.009)	(0.013)	(0.012)	(0.012)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Grid FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Nxt	522963	522963	522963	522963	522963	522963	522963	522963
N	32685	32685	32685	32685	32685	32685	32685	32685
Mean dep. var	0.769	0.101	0.025	0.058	0.066	0.217	0.164	0.139
R-squared	0.116	0.101	0.141	0.066	0.055	0.062	0.135	0.070
Within R-squared	0.036	0.005	0.003	0.004	0.007	0.009	0.076	0.010

Notes: Two-way fixed effects panel data regression. Ring 1: 0.00 km-3.16 km, ring 2: 3.17 km-3.82 km, ring 3: 3.83 km-4.61 km, ring 4: 4.62 km-26.68 km, ring 5: 26.69 km-82.84 km, ring 6: 82.85 km-131.33 km, and ring 7: 131.34 km-150.00 km. Ring 7 is the reference group. All the estimations include marital status, having children under 18 years old, and educational levels as controls, as well as grid and time fixed effects.

The primary sector includes the extraction and agricultural sector; the secondary sector includes manufacturing and construction; and the tertiary sector includes services, healthcare, the public sector, and others. Standard errors (in parentheses) are clustered at the grid level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.8: Robustness checks: impact of the mining boom for residents, 2000-2015

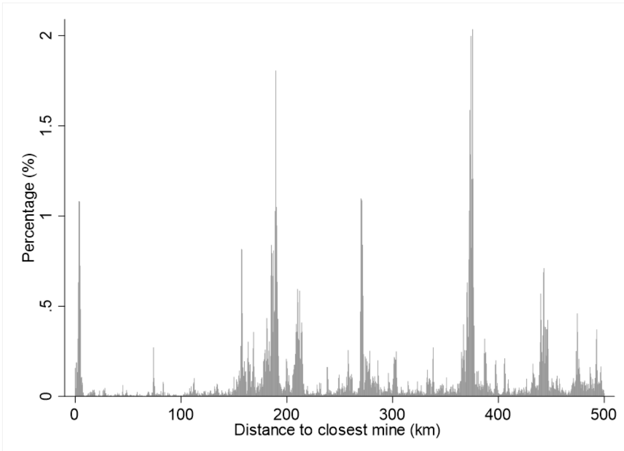
	(1) Baseline model	(2) Population less 55 years	(3) With municipality FEs	(4) Other ring classification	(5) Boom and bust	(6) Two-way clustering	(7) Omit publicly employed workers	(8) Gällivare municipality	(9) Kiruna municipality	(10) Winsorize > $p99$ earnings
	β / SE	β / SE	β / SE	β / SE	β / SE	β / SE	β / SE	β / SE	β / SE	β / SE
Post*Ring 1	275.375***	261.431***	285.409***			275.375***	314.414***	154.067***	327.390***	247.467***
	(19.473)	(21.418)	(18.531)			(42.136)	(23.037)	(35.969)	(68.081)	(16.166)
Post*Ring 2	237.157***	238.915***	244.711***			237.157***	268.006***	89.682**	255.441***	215.407***
	(17.068)	(18.402)	(17.138)			(38.775)	(19.982)	(44.179)	(63.364)	(16.303)
Post*Ring 3	247.305***	245.229***	251.560***			247.305***	270.651***	105.935***	279.262***	229.863***
	(17.813)	(18.942)	(17.660)			(39.459)	(20.255)	(39.176)	(63.756)	(16.795)
Post*Ring 4	232.821***	228.480***	232.769***			232.821***	261.932***	112.760***	261.703***	214.117***
	(17.727)	(19.262)	(17.194)			(32.701)	(20.816)	(33.591)	(65.848)	(16.719)
Post*Ring 5	70.820***	63.043***	71.123***			70.820***	70.925***	0.000	0.000	62.993***
	(20.883)	(21.271)	(20.215)			(22.268)	(24.032)	(.)	(.)	(20.307)
Post*Ring 6	43.318***	43.870**	39.039**			43.318**	31.680			42.178**
	(16.627)	(19.130)	(16.348)			(16.486)	(19.509)			(16.372)
Post*Ring A1				252.761***						
				(14.475)						
Post*Ring A2				232.851***						
				(17.724)						
Post*Ring A3				70.827***						
				(20.885)						
Post*Ring A4				43.317***						
				(16.628)						
2004-2011*Ring 1					225.096***					
					(18.139)					
2004-2011*Ring 2					190.904***					
					(15.542)					
2004-2011*Ring 3					194.499***					
					(16.563)					
2004-2011*Ring 4					194.660***					

					(16.136)					
2004-2011*Ring 5					56.586***					
					(19.210)					
2004-2011*Ring 6					34.316**					
					(15.477)					
2012-2015*Ring 1					464.789***					
					(31.289)					
2012-2015*Ring 2					403.421***					
					(28.673)					
2012-2015*Ring 3					433.605***					
					(28.637)					
2012-2015*Ring 4					373.792***					
					(30.151)					
2012-2015*Ring 5					131.855***					
					(32.985)					
2012-2015*Ring 6					80.043***					
					(28.372)					
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Individual FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Grid FE	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Municipality FE	No	No	Yes	No	No	No	No	No	No	No
Nxt	522963	384683	522963	522963	522963	522963	437216	162228	191189	517709
N	32685	24043	32685	32685	32685	32685	27326	10139	11949	32357
Mean dep. var	1830	1957	1830	1830	1830	1830	1765	1922	2059	1780
R-squared	0.821	0.825	0.817	0.821	0.822	0.821	0.834	0.829	0.829	0.817
Within R-squared	0.281	0.211	0.284	0.281	0.283	0.281	0.280	0.292	0.318	0.303

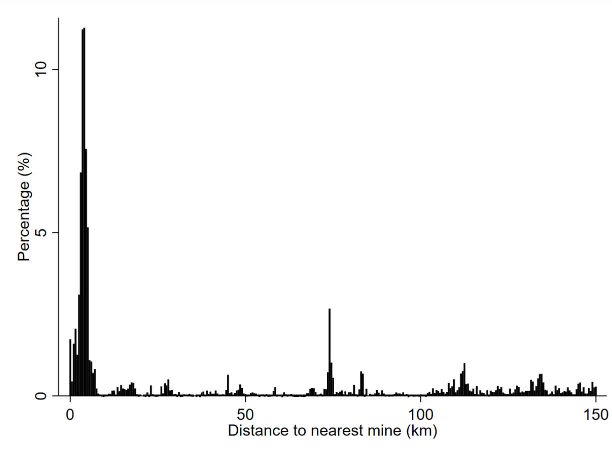
Notes: Two-way fixed effects panel data regression. Yearly earnings (in 100 SEK) are deflated to 2000 values via the national CPI. Yearly earnings are analyzed in 100 Swedish krona values (in 100 SEK). Ring 1: 0.00 km-3.16 km, ring 2: 3.17 km-3.82 km, ring 3: 3.83 km-4.61 km, ring 4: 4.62 km-26.68 km, ring 5: 26.69 km-82.84 km, ring 6: 82.85 km-131.33 km, and ring 7: 131.34 km-150.00 km. Ring 7 is the reference group. Ring A1: 0.00 km-4.61 km, ring A2:

4.62 km-26.68 km, ring A3: 26.69 km-82.84 km, ring A4: 82.85 km-131.33 km, and ring A5: 131.34 km-150.00 km. Ring A5 is the reference group. We consider the years 2004-2011 as the boom period and 2012-2015 as the bust period. All the estimations include marital status, having children under 18 years old, educational levels, and economic sectors as controls, as well as individual, grid, and time fixed effects. Standard errors (in parentheses) are clustered at the grid level. In Column (7), two-way clustering of standard errors (in parentheses) by geography (grids) and year is shown. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

B Appendix: Additional figures



(a) Maximum 500 km



(b) Maximum 150 km

Figure B.1: Distribution of individuals according to their distance to the nearest mine

Notes: The figure shows the distribution of individuals according to their distance to the nearest mine at a maximum of 500 km and zooming into less than 150 km.

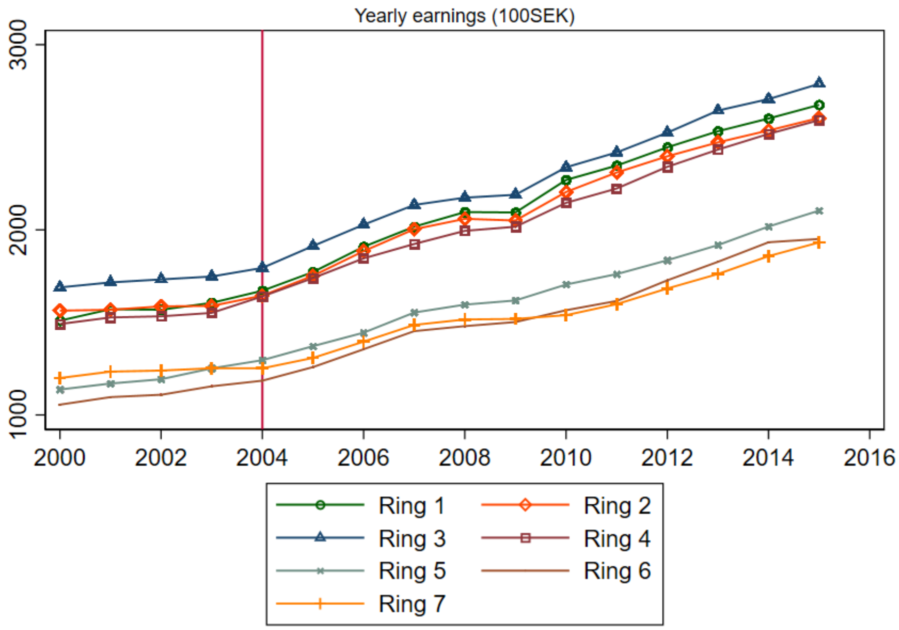
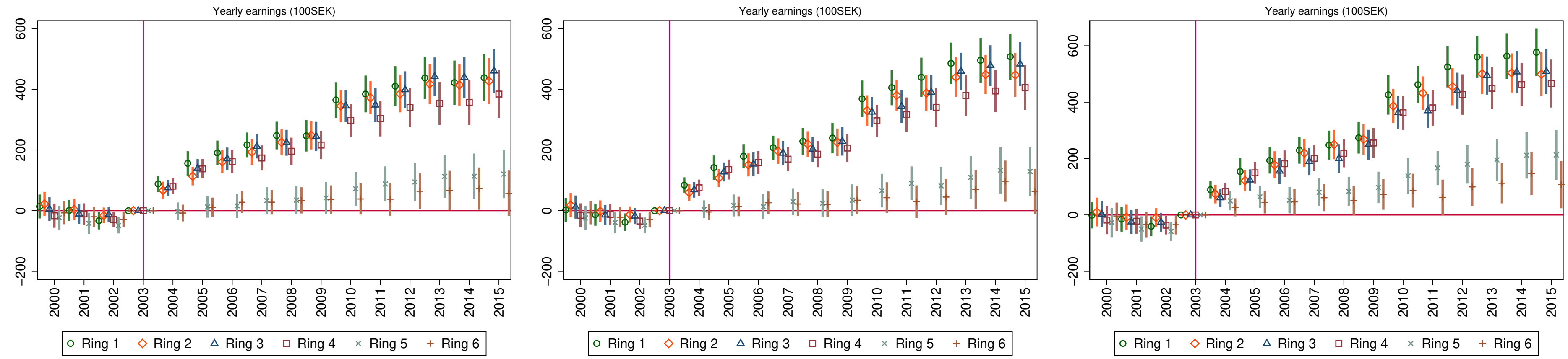


Figure B.2: Yearly earnings (in 100 SEK) separately by treated groups (rings), 2000-2015

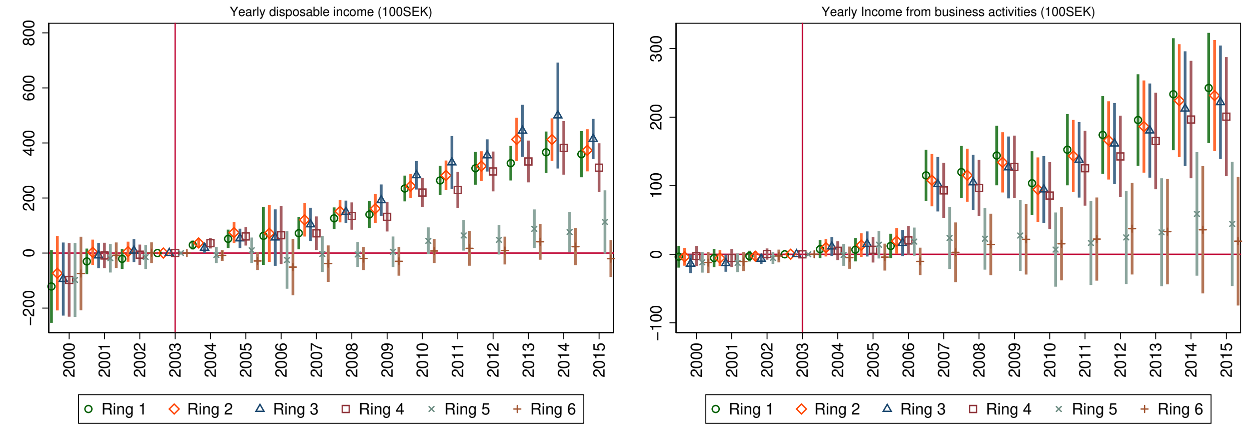
Notes: Yearly earnings (in 100 SEK) are deflated to 2000 values using the national CPI. Yearly earnings are analyzed in 100 Swedish krona values (in 100 SEK). Ring 1: 0.00 km-3.16 km, ring 2: 3.17 km-3.82 km, ring 3: 3.83 km-4.61 km, ring 4: 4.62 km-26.68 km, ring 5: 26.69 km-82.84 km, ring 6: 82.8 5 km-131.33 km, and ring 7: 131.34 km-150.00 km.



(a) Earnings-Distance 2003 (b) Earnings-Residents (c) Earnings-Employed

Figure B.3: Event study of the impact of the mining boom on yearly earnings (in 100 SEK) using distance in 2003, for residents and employed, 2000-2015

Notes: Yearly earnings (in 100 SEK) are deflated to 2000 values using the national CPI. Yearly earnings are analyzed in 100 Swedish krona values (in 100 SEK). Ring 1: 0.00 km-3.16 km, ring 2: 3.17 km-3.82 km, ring 3: 3.83 km-4.61 km, ring 4: 4.62 km-26.68 km, ring 5: 26.69 km-82.84 km, ring 6: 82.85 km-131.33 km, and ring 7: 131.34 km-150.00 km. Ring 7 and year 2003 are the references. 95% confidence interval shown. Estimation includes marital status, having children under 18 years old, educational levels, and economic sectors as controls, as well as individual, grid, and time fixed effects. Standard errors are clustered at the grid level.



(a) Disposable income

(b) Income from business activities

Figure B.4: Event study of the impact of the mining boom on yearly disposable income (in 100 SEK) and income from business activities (in 100 SEK), 2000-2015

Notes: Yearly earnings (in 100 SEK), disposable income (in 100 SEK), and income from business activities (in 100 SEK) are deflated to 2000 values using the national CPI. These variables are analyzed in 100 Swedish krona values (in 100 SEK). Ring 1: 0.00 km-3.16 km, ring 2: 3.17 km-3.82 km, ring 3: 3.83 km-4.61 km, ring 4: 4.62 km-26.68 km, ring 5: 26.69 km-82.84 km, ring 6: 82.85 km-131.33 km, and ring 7: 131.34 km-150.00 km. Ring 7 is the reference group. 95% confidence interval shown. Estimation includes marital status, having children under 18 years old, educational levels, and economic sectors as controls, as well as individual, grid, and time fixed effects. Standard errors are clustered at the grid level.

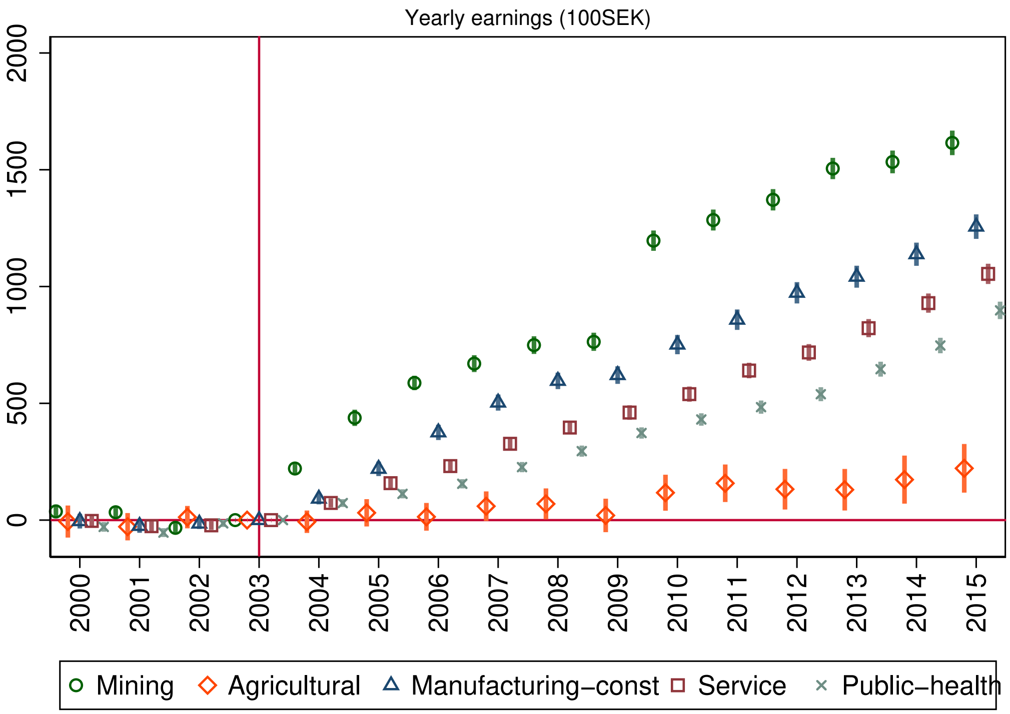
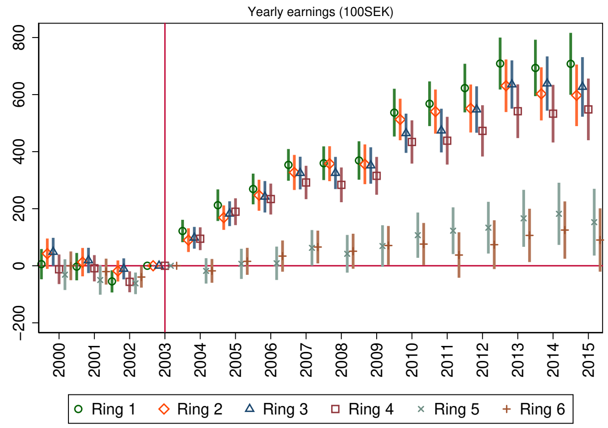
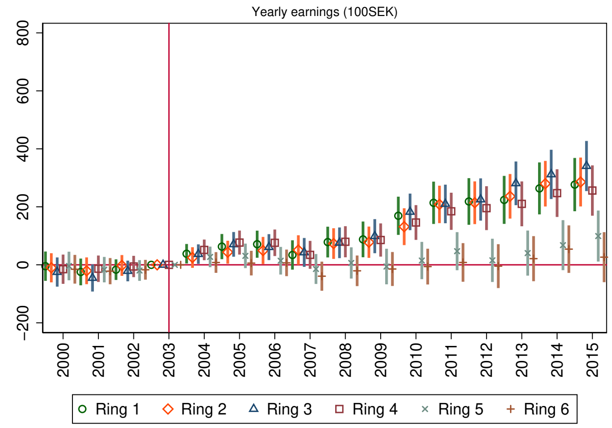


Figure B.5: Event study of the impact of the mining boom on yearly earnings (in 100 SEK) for workers by economic sector, 2000-2015

Notes: Yearly earnings (in 100 SEK) are deflated to 2000 values using the national CPI. Yearly earnings are analyzed in 100 Swedish krona values (in 100 SEK). Nonemployed individuals and the year 2003 are the reference groups. 95% confidence interval shown. Estimation includes marital status, having children under 18 years old, and educational levels as controls, as well as individual, grid, and time fixed effects. Standard errors are clustered at the grid level.



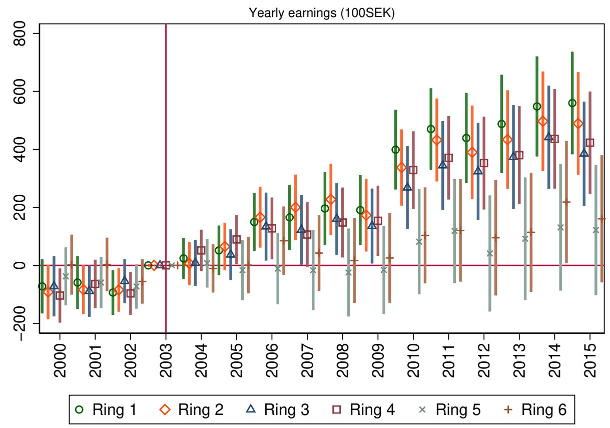
(a) Male



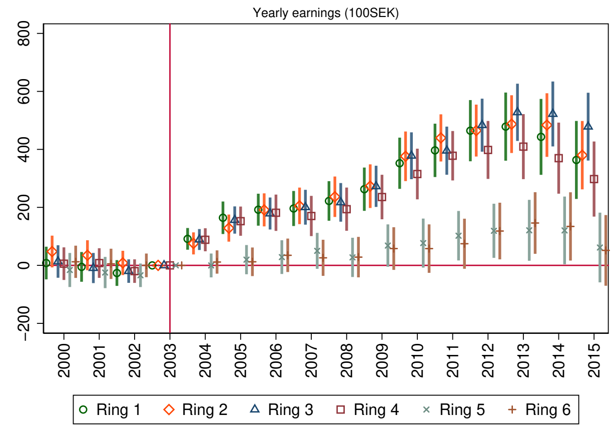
(b) Female

Figure B.6: Event study of the impact of the mining boom on yearly earnings (in 100 SEK) by gender, 2000-2015

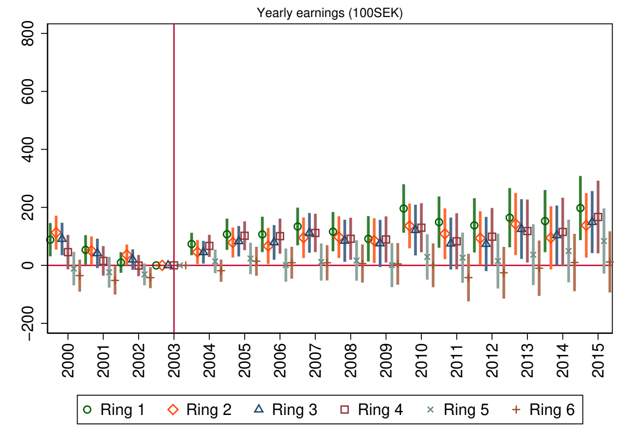
Notes: Yearly earnings (in 100 SEK) are deflated to 2000 values using the national CPI. Yearly earnings are analyzed in 100 Swedish krona values (in 100 SEK). Ring 1: 0.00 km-3.16 km, ring 2: 3.17 km-3.82 km, ring 3: 3.83 km-4.61 km, ring 4: 4.62 km-26.68 km, ring 5: 26.69 km-82.84 km, ring 6: 82.85 km-131.33 km, and ring 7: 131.34 km-150.00 km. Ring 7 is the reference group. 95% confidence interval shown. Estimation includes marital status, having children under 18 years old, educational levels, and economic sectors as controls, as well as individual, grid, and time fixed effects. Standard errors are clustered at the grid level.



(a) 18-30



(b) 31-50



(c) 51-65

Figure B.7: Event study of the impact of the mining boom on yearly earnings (in 100 SEK) by age, 2000-2015

Notes: Yearly earnings (in 100 SEK) are deflated to 2000 values using the national CPI. Yearly earnings are analyzed in 100 Swedish krona values (in 100 SEK). Ring 1: 0.00 km-3.16 km, ring 2: 3.17 km-3.82 km, ring 3: 3.83 km-4.61 km, ring 4: 4.62 km-26.68 km, ring 5: 26.69 km-82.84 km, ring 6: 82.85 km-131.33 km, and ring 7: 131.34 km-150.00 km. Ring 7 is the reference group. 95% confidence interval shown. Estimation includes marital status, having children under 18 years old, educational levels, and economic sectors as controls, as well as individual, grid, and time fixed effects. Standard errors are clustered at the grid level.