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Mining towns and migration: Comparing three South African cases

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Introduction: The South African economy has a long history of mining exploration. The first mining operations were recorded in 1852. Literature has expressed the need to continue exploring the implications of internal and cross-border in-migration on the labor market of destination areas. This paper investigates migration patterns in South Africa by focusing on three mining towns (Postmasburg, Rustenburg and Emalahleni) in three different provinces.

Methods: This paper utilizes survey data from primary sources to investigate the potential link between migration patterns and mining output. The surveys formed part of an interdisciplinary research project under the auspices of the Center of Development Studies (CDS) at the University of the Free State.

Results and discussion: Postmasburg is the only mining town that experienced recent periods of expansion. This is reflected in the significant increase in the number of migrants moving to Postmasburg during 2011 and 2012, and the shorter average length of stay of migrants in Postmasburg (7.2 years compared to 9.8 years in Emalahleni and 11.0 in Rustenburg). The results resonate with the neo-classical notion of self-interest among younger people as a motivating factor for migration. Migrants in our samples were significantly younger than the locally-born respondents and display higher levels of education. Empirical results confirm this positive return on increased education levels with a positive and highly statistically significant return to every additional year of formal education. In all three towns, the dummy variable included to represent a distinction between mineworkers and non-mineworkers was statically significant. This confirms the general perception that mineworkers in all these communities receive a premium in terms of their monthly earnings—even after controlling for different levels of education. As part of a future research agenda, the role of environmental factors as a driver of migration could also be investigated in depth in Southern Africa.

KEYWORDS

mining towns, migration, South Africa, migration patterns, mine workers

1. Introduction and aim

The South African economy has a long history of mining exploration. The first mining operations were recorded in 1852, with copper exploration in the Northern Cape Province. Coal mining started in 1879 and 1895 in Vereeniging and Witbank. The first diamonds were discovered in 1860 and 1871 and the first platinum deposits in 1924 (Casey, 2019). The gold reefs close to Johannesburg were discovered in 1886 (Britannica, 2022). The discovery of diamonds, and gold, in particular, attracted investments, which led to immigration, urbanization and labor migrancy.

Migration has been of interest to social scientists (including economists) for more than a hundred years (Molloy et al., 2011). Interest was specifically focused on the rural-urban migration in the early decades of the previous century (Molloy et al., 2011). Research interest was directed specifically to issues such as the social costs of migration. Examples include the “brain drain” from rural areas and the challenges faced by destination cities that were absorbing migrants (Long, 1988; Adepoju, 2000; Molloy et al., 2011). In a more

recent conceptual development—extending Diamond, Mortenson, and Pissarides's labor market search theory with frictions—economists began to view migration as a part of a search and matching problem because the geographic dimension of search that migration frequently necessitates is an important component of general labor market search (Shimer, 2007; Molloy et al., 2011).

Apart from the historical links between migration and mining activities in South Africa, the issue of migration is also of additional interest within the South African context (Kollamparambil, 2017). Under the Apartheid government, the majority's freedom of movement was restricted through the oppressive Group Areas Act and Influx Control policies (Zuma, 2013; Kollamparambil, 2017). The elimination of these policies with the end of Apartheid meant that, in the years that followed, South Africa experienced accelerated urban migration (Mulcahy and Kollamparambil, 2016; Kollamparambil, 2017).

Furthermore, the issue of international migrant workers in the mining sector entails varied mobility patterns. It also produces political, legal, economic and social questions with consequences that have not received the attention demanded from researchers (Coderre-Proulx et al., 2016). For example, in South Africa, as a result of its porous borders, the government finds it difficult to exercise control over migration flows (Coderre-Proulx et al., 2016).

This paper heads to the call of Coderre-Proulx et al. (2016) as well as the Human Development Report of 2009 [United Nations Development Programme (UNDP), 2009], which highlighted the need to continue exploring the implications of internal and cross-border in-migration on the labor market of destination areas. Against this background, the paper investigates migration patterns in the Global South by focusing on three mining towns in three different provinces of South Africa: Postmasburg, Rustenburg and Emalahleni. The economies of these towns are built on three different minerals: manganese, platinum and coal. These relatively rural towns are chosen because mining is the main and sometimes almost the only economic activity. It is therefore easier to attribute migration patterns to mining activities compared to, for instance, Johannesburg, the center of gold mining activities, which is also the financial hub of South Africa. The paper aims to determine whether migration patterns observed in these three South African mining towns correspond to patterns observed globally and discussed in theory. The rest of the article is deployed as follows. The chosen theoretical framework is discussed, followed by a review of the relevant literature, background on three mining towns chosen for this study, the research method, empirical results and discussion. The article concludes with appropriate conclusions and areas for further research.

2. Literature review

2.1. Theoretical framework and globalization in the global North

Regarding the relevant theoretical considerations linked with migration, Massey et al. (1993) made the important point that international migration lacks a unifying theoretical framework. Given the absence of such a universally accepted and robust framework, a succession of, what can be described as sometimes

quite disparate theories, emerged and evolved during recent decades. Examples include immigration policy, cross-border migration flows as well as internal population movements (Massey et al., 1993). Massey et al. (1993) acknowledge a degree of overlap and interdependence among these theoretical and analytical strands in the literature regarding migration studies. They further emphasize that there is definitely space for more scholarly endeavors in this field and furthermore assert that "...a full understanding of contemporary migratory processes will not be achieved by relying on the tools of one discipline alone, or by focusing on a single level of analysis" (Massey et al., 1993, p. 432).

As an example of the above evolution, Borjas (1987) explains one of the main reasons why workers migrate as a quest to move from a labor market with a low return on skill levels to a labor market with a higher return. This view echoes elements of the micro-level of neoclassical economic theory, assuming that individual migrants base their decision to move from one area, region or country to another on rational self-interest (Massey et al., 1993). The decision to migrate is expected to yield a positive net return in terms of improved socio-economic outcomes for the individual migrant (Massey et al., 1993). This assumption is indeed a reasonable one in the case of unforced migration. Survival is the sole benefit or positive outcome in the scenario of forced migration. Factors resulting in forced migration can be natural disasters (e.g., drought, hurricanes) and/or man-made reasons, such as political and/or religious persecution, civil unrest and civil wars (Massey et al., 1993).

The above theoretical framework's analysis of forced migration resonates with the work of Adepoju (1995, 2000). The pull effect of the possibility of improved living conditions and economic outcomes in the Global North is therefore an appealing factor for many Africans faced with fast deteriorating socio-political and economic conditions in their home countries—which can be seen as a push factor in this regard (Adepoju, 2000).

Magill (1964) reflected on reasons for migration in the Global North. One of the pertinent examples used is the Highlanders, who arrived in the New World between 1802 and 1828. They left their homeland behind for a variety of reasons. These include, *inter alia*, the economic pressures in Scotland, the desire for exercising freedom of religion, and a longing for adventure (Magill, 1964). Their migration patterns adhered to one of the fundamental laws of migration in that the migrants were attracted to large industrial regions (Magill, 1964). Furthermore, internal migration in the USA has found to be pro-cyclical—it increases during economic growth and decreases during periods of decline (Molloy et al., 2011).

Ogasawara (2021) investigated the impact of mining activities on internal migration in Japan. Agglomeration theory suggests that resource wealth can increase the demand for labor in the mining sector and related industries. This can cause a potential influx of population and agglomeration (Lederman and Maloney, 2007; Ogasawara, 2021). As could be expected, populations in mining towns grow (56%) due to internal migration. This led to a lower labor force participation rate for females. While mining activity is expected to attract migrants, most of them are expected to be internal migrants (Ogasawara, 2021).

Silvestre (2005) showed that internal migration in Spain was driven by similar economic forces and a rural population experiencing the pull of industrial and urban destinations. Silvestre

(2005) used specific variables for origins and destinations in the empirical analysis and confirmed that internal migration in Spain was primarily motivated by economic incentives such as the benefits derived from differentials in real wage and expected income gaps, and the costs of moving and job search.

The same fundamental factors have also been in evidence in the available literature since the 1950's on the causes of internal migrations in developing countries (Silvestre, 2005). Estimated macro-migration equations (constructed with censuses or similar aggregate data) for developing countries showed significant impacts of various economic variables, e.g., reflective of the cost and potential benefits of migration (Silvestre, 2005). More recently, more sophisticated microeconomic literature also confirmed the relevance of economic forces in explaining migration patterns in the Global South (Silvestre, 2005).

2.2. Migration and mining in the global South and South Africa in particular

Lucas (1985) investigated migration among the Batswana people. While acknowledging the possible increase in labor demand as per the agglomeration theory, his paper suggests that if it is assumed that potential migrants respond positively to the probability of obtaining employment in the town in question, it can be shown [as per the model of Harris and Todaro (1970)] that, in certain parametric ranges, urban job creation may, in fact, worsen unemployment and in severe cases even decrease output (Lucas, 1985).

In acceptance of the potential adverse outcome highlighted above, economists now often model the occurrence that migrants come to town despite existing unemployment as a process of migration in order to search for a job (Lucas, 1985). One of the findings in this strand of the literature is the significant impact of the length of time in town as part of the estimates of the relevant earnings equations. It may therefore be argued that new arrivals in town cannot afford to be unemployed for any significant period of time and as a result soon accept a job (Lucas, 1985).

The jobs in question are often low paying in the informal sector. The continued search activity is then for employment with improved remuneration, perhaps in the formal sector (Lucas, 1985). Furthermore, in the case of Sub-Saharan Africa, there are developments that are expected to further reduce the employment of neighboring countries' citizens in South Africa's mining industry over time (Davies and Head, 1995). The authors further caution that a multiplier may indeed also be active. The implication is that (in the absence of regional cooperation programmes that are able to promote economic growth and employment) each job lost by a mineworker could generate pressures and incentives for more than one family member to migrate clandestinely to South Africa (Davies and Head, 1995). One must also keep in mind that in the event that a migrant worker loses his job, the implication is also that he is less able to send remittances to families back home (Bastia, 2011a). This, in turn, can negatively impact the well-being of the former mineworker as well as those who rely on remittances to pay for everyday expenses or to finance upward mobility strategies such as education [International Organization for Migration (IOM),

2009; Bastia, 2011a]. The pressure and incentives for clandestine migration referred to by Davies and Head (1995) will be further accentuated as a result.

Referring back to the South African mining industry in particular, Marais and Cloete (2013) make an important point that specific discussions on the relationship between labor migration, settlement and mine closure are lacking in the South African literature on these activities. This observation is all the more important because the very existence of mining towns is dependent on the presence of mineral deposits (Magill, 1964; Marais and Cloete, 2013). Mining towns are often located in regions with limited alternative economic activity and the mine is essentially the only viable employment option for most of the inhabitants—especially the migrant population (Magill, 1964; Neil et al., 1992; Marais and Cloete, 2013). The closing of mines often goes hand in hand with significant outmigration from the now economically depressed town and area (Magill, 1964). An alternative outcome is the occurrence of intra-town migration after a mine closure. The former mine workers are often left with no choice but to move to a new home and a place of transition, i.e., the informal urban settlement (Bastia, 2011b). Workers who once were productive and politically organized now become amalgamated in the ranks of the marginalized urban unemployed, or if they are lucky, underemployed in the informal sector as day laborers or informally self-employed as waste pickers (Bastia, 2011b; Blaauw, 2017). The above migration outcomes must be viewed against the changing dynamics of legal migration to and from South African mines as a result of particular developments in South Africa and its neighboring countries.

2.3. Changing patterns of legal migration to the mines in South Africa

Davies and Head (1995, p. 440) view South Africa as the industrial core of a regional economy with distinctive relations with her neighbors for longer than a century. The demand for and supply of migrant labor for South Africa's mining industry lie at the heart of this interdependence (Davies and Head, 1995, p. 440). A key element of this relationship has been the creation of a labor force for present needs, but at the same time a reservoir of surplus labor has also been developed that could form part of the production function in times of expansion – keeping wages from increasing and being excluded from it in times of recession (Davies and Head, 1995, p. 440).

Available literature identified four phases in this process. The first phase lasted from the late 1800's to around 1910 and consisted of the creation of a migrant labor force (Legassick and De Clerq, 1985; Davies and Head, 1995). The second phase (from 1910 until the 1960's) was characterized by redistribution between different capitals. Phase three (which began in the 1960's) featured the removal of surplus labor from production in the mining industry (Legassick and De Clerq, 1985; Davies and Head, 1995). Although the total period since the mid-1970's was one of significant decreases in the employment of "oreign" migrant labor, a case can be made for two sub-phases in this regard. Firstly, more or less from the early 1970's to approximately 1985, the consistent

substitution of large numbers of foreign migrant workers by South African workers as a result of an effort by the mines to minimize their dependence on what were seen as unstable sources of labor (Legassick and De Clerq, 1985; Davies and Head, 1995) took place. Simultaneously, efforts to increase the productivity and cost-effectiveness of longer labor contracts and reduced turnover were also well underway. Since the mid-1980's, the industry itself saw a significant downsizing effect accompanied by a major across-the-board reduction in employment (Legassick and De Clerq, 1985; Davies and Head, 1995). This effectively constituted the second sub-phase.

The following statistics serve as an example. According to Crush et al. (1991), the ten original members of the Southern African Development Community (SADC) provided 73.8% of the black workers employed in gold and coal mines owned by the South African Chamber of Mines (COM) in 1975 (Davies and Head, 1995). By 1982, this percentage decreased by more than 30 percentage points to 42.8% (Davies and Head, 1995). Until 1986, the total number and proportion of African workers employed in gold and coal mines increased. Since 1987, and principally after the August 1987 strike, this was no longer the case (Davies and Head, 1995).

The background to the overall decrease in employment in the mines was a depressed world gold price. Furthermore, most mines in South Africa had begun to reach their production peak. Given the changes described above and analyzing the trends in the supply of foreign labor, the continuous phasing out of foreign migrant labor seems to be a logical conclusion reached by the literature (Davies and Head, 1995).

2.4. Changing patterns of underground/illegal migration in South Africa

The literature concludes that, on the one hand, the employment of legal migrant workers in the mining industry has continuously decreased, and illegal or underground migration has escalated at the same time (Davies and Head, 1995). Factors such as the civil war in Mozambique, for example, caused the migration of vast numbers of refugees across southern Africa—reaching a peak of a million and a half Mozambicans in six SADC-member countries, and a further 300,000 in South Africa (Davies and Head, 1995). Despite the fact that large numbers of wartime migrants have subsequently returned to their homeland, the number of illegal migrants into South Africa has actually increased (Davies and Head, 1995). Economic factors such as poverty and unemployment, low agricultural productivity, as well as inadequate alternative livelihood sources in home countries are the driving forces behind this phenomenon (Davies and Head, 1995; Adepoju, 2000; Yakubu and Chalisung, 2018).

In addition to the more general observations highlighted above, a few studies focused on migration trends around mining towns. The lifespan of a mine consists of a few stages: growth (exploration and development), decline and closure. Each stage involves a different mix of skilled and low-skilled workers (Nyame et al., 2009)—with the development stage likely to employ more people

and people with varying skills levels. A decline in mining activity may be due to lower mineral prices, reserves being depleted, high production costs, unfavorable policies, etc. The Nyame et al. (2009) study on mining migration patterns in Ghana observed a number of distinct patterns. The growth phase is the most likely to attract migrant workers. Apart from potential mine workers, traders are also likely to migrate during the development phase in order to sell their goods. The declining phase is characterized by an outflow of workers. Skilled migrant workers are more likely to leave during the decline phase as they are more likely to find employment at other mining sites. Compared to internal migrants, international migrants stay longer at mining sites. Mine closures and a declining local economy usually result in an emigration event (Nyame et al., 2009).

The following section briefly provides relevant background to each of the three South African mining towns used in this study to determine whether the observed migration patterns correspond to patterns observed globally and discussed in the theory and literature review presented above.

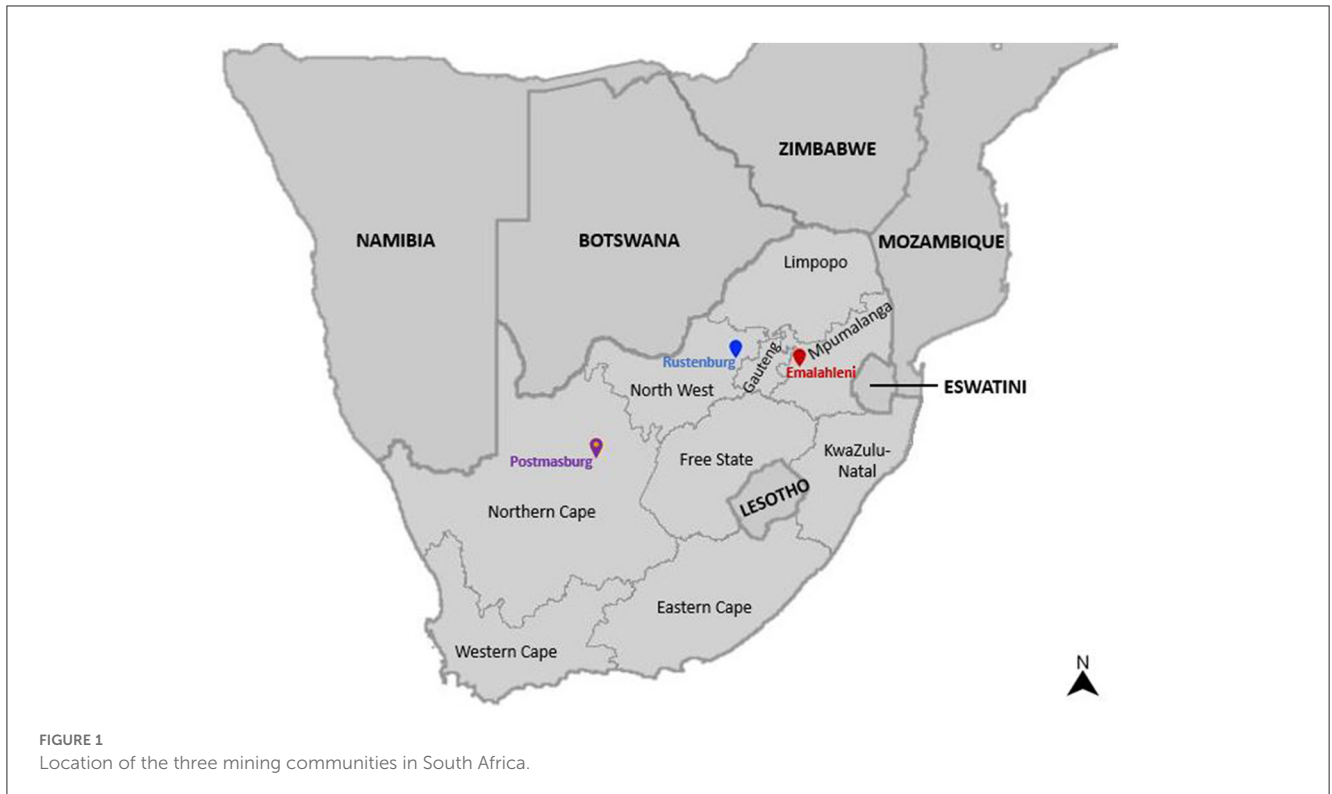
3. Brief background on three towns

Figure 1 indicates the location of the three mining communities used as a case study for this study.

All three locations for the study share similar development characteristics—intrinsically linked to the discovery of the mineral deposits in each town/city. Postmasburg's mining history dates back to between 1923 and 1926, with the discovery of the first economically viable deposits of manganese (Marais et al., 2018). The Union Manganese and South African Manganese Company were formed in 1929. It later became Assmang (the mining company that owns the Beeshoek Mine today) (Marais et al., 2018). Witbank (currently known as Emalahleni) was founded on the growing demand for coal. The Witbank Colliery established the town in 1903 (South African Cities Network, 2019). Power generation from coal was an early component of the Witbank economy—and remains so today (South African Cities Network, 2019). The origin of mining in the Rustenburg area dates back to the mid-1920's, when an exceptionally platinum-rich segment was discovered on a farm a few miles to the east of the town of Rustenburg (Oranje et al., 2021).

The Second World War was a key element in the acceleration of mining in both Witbank (currently Emalahleni) and Rustenburg. Mining in the Rustenburg area grew rapidly to meet the demand for platinum as a crucial component in the production of ammunition (Oranje et al., 2021). The demand for coal rapidly increased during the war and so did the output from the mines in the Witbank area (South African Cities Network, 2019).

Recent developments in all three locations seemingly display the typical boom and bust cycles evident in mining locations across the world. In Postmasburg, after a relatively uneventful 40 years, the next big change was in 1999 when a new open-cast mine (Beeshoek South) was opened. Kumba Iron Ore opened the Kolomela Mine just outside Postmasburg in 2011, with an expected lifespan of around 29 years (Marais et al., 2018). Rustenburg saw a meteoric increase in the demand for platinum in the 1990's. This fuelled a surge in the exploration of PGMs and the opening of



new mines in the area. By 2003, the supply emanating from the increased exploration in South Africa was coming to market and the enthusiasm for exploration started to wane (Oranje et al., 2021). Witbank experienced similar boom and bust cycles.

The most recent census data available shed some light on the income and education levels of the three local districts in which the three towns are situated—see *Statistics South Africa* (2022). In Emalahleni 2.9% of persons older than 20 years had no schooling, compared to 5.4% in Rustenburg and 13.7% in Postmasburg. Income levels are reported in predetermined categories. For Postmasburg, the most prevalent category ranges between R19 601 and R38 200. In both of the other cases, a higher category ranging between R38 201 and R76 400 represent the highest share of the population. It is therefore clear that the rural town of Postmasburg had the lowest education levels, followed by Rustenburg and then Emalahleni. Postmasburg also recorded the lowest income levels—with Rustenburg and Emalahleni recording the same income levels (*Statistics South Africa*, 2022).

4. Methodology

Traditionally, migration patterns would be identified from official data from national censuses—population information per town and district over time. Trends in population data would be extracted to see whether it follows the expected pro-cyclical patterns of mining production (and commodity prices), and whether it follows the expected trends linked to mining growth and decline. This paper, however, deviates from the traditional approach and utilizes survey data from primary sources to investigate the potential link between migration patterns and

mining output where the data allows such analysis¹. achieve the same goal. The said survey data for each town indicates the origin of migrant workers, their length of stay (which could be linked with mining phases), education levels, as well as their employment status. Specific population characteristics would indicate whether migrant workers were local or international, and their education levels could indicate potential differences in skills levels.

The surveys in question formed part of an interdisciplinary research project under the auspices of the Center of Development Studies (CDS) at the University of the Free State. The individual and household surveys used questionnaire(s) similar in content, format and outlay to the NIDS (National Income Dynamic Study)² survey conducted by South African Labor and Development Research Unit (SALDRU) at the University of the Cape Town (UCT). The surveys obtained personal information about households and household members. The research instruments covered aspects such as migration patterns and economic activities. Specific questions about potential mining employment, income levels, housing information, satisfaction with their dwelling, level and satisfaction with service delivery at the dwelling, household spending—income and assets also formed part of the questionnaires. The surveys concluded with aspects on well-being, social cohesion and crime in the various communities. Marais et al. (2018, 2021, 2022) provide further detail in terms of the survey instruments for the overall research project.

¹ The Postmasburg data (where mining activities saw a recent increase) specifically made this possible.

² Detail in terms of the background and research instruments of the NIDS surveys can be found at: <http://www.nids.uct.ac.za/about/what-is-nids>.

The same surveys were completed in the Postmasburg, Emalahleni, and Rustenburg local municipality in 2015, 2017, and toward the end of 2018, respectively. The household surveys were completed by one member of the household on behalf of the household, and individual surveys formed the foundation of the analysis. Households from both formal and informal settlements were interviewed from all the residential areas in, for example, Emalahleni to ensure that the survey is indeed representative of the respective cities. These structured questionnaires were completed by fieldworkers recruited from the local population and who were well trained. Several households were contacted afterwards to confirm that the fieldworkers completed with the correct members of the household. The questionnaires as well as the data gathering process were approved by the relevant Ethics Committee of the University of the Free State.

The analysis is based on individual questionnaires completed in each of the three towns. Questionnaires were completed by individuals, individuals on behalf of households and businesses. Data is sampled from the individual questionnaires and while several members of the same household were interviewed, only data from the household head and partner is included—while surveys completed by grandparents, parents, children and grandchildren living in the same household were excluded.

The most important question was considered to be whether the respondent has lived in this town for his/her whole life. This is used to classify the individual as being local or an immigrant. Next, we considered the year when the person moved to the town to determine the length of stay. The respondents additionally indicated from where they migrated to the town: from another country or from a specific province in South Africa. Another important indicator is whether the person was working at a mine at the time of the interview, the monthly earnings as well as monthly take-home pay. The above indicators were then analyzed to paint a picture of migration to the specific town as well as to determine differences between categories of residents in these mining towns.

5. Results and discussion

Table 1 presents the demographic characteristics of locals and migrants in the three mining communities chosen for this study.

As indicated above, the starting point of the analysis is the response to the question: “Did you live in this town your whole life.” The two responses led to the breakdown in Table 1. In all three towns, the locally-born respondents were more than the immigrants—with a ratio of 51.2% local vs. 48.8% immigrants being the closest for Postmasburg in the Northern Cape. Out of the three towns, this is the one where the most recent mining developments took place.

In all three towns, the immigrants in our samples are on average younger than the locally born. This is to be expected, as the younger generation, probably without children eligible to attend school, is more mobile. The last section of Table 1 reports on the average number of years that the two categories of immigrants have been living in the specific mining town. The shortest stay is calculated for immigrants in Postmasburg—where those immigrants working in the mines were there for an average of 7.2 years at the time of the

survey. On the other side of the coin, mineworkers in Rustenburg reported an average stay of 11 years.

Linked to the topic of length of stay in the mining towns, Figure 2 provides a graphical representation of the number of newcomers to each town per year. The horizontal axis indicates the year of arrival and the vertical axis the number of persons locating to the town during the specific year. Please note that the scales differ—with Postmasburg receiving much higher numbers during the later years.

Section 3 referred to the expansion of mining activities around Postmasburg in 1999 and 2011. This corresponds with the spikes in the graph as well as the literature indicating that increased migration (and new job opportunities) is expected during the initial set-up phase of a mine. Also notice the spike in the number of newcomers not working in the mines around these events.

Respondents are notoriously reluctant to answer questions relating to income. However, calculations based on the gathered information rendered the expected results. Table 2 summarizes the average income as reported by the different categories of residents. These are nominal values as reported by the respondents.³

Table 2 distinguishes between local residents and immigrants. It furthermore provides indications of income for the whole sample—compared to that of mineworkers and non-mineworkers. Although the questionnaire asked respondents to report both their gross monthly income as well as take-home income after deductions, only the averages of monthly income are reported. Both income indicators show the same trend and preference is given to gross income—which is also used in the regression analysis reported in Table 4. As was expected, the income of mineworkers is higher than income of non-mineworkers regardless of migration status or location. Overall, income levels in Postmasburg, the smallest and most rural of the three towns, are the lowest. The other general observation is the higher income levels of immigrants compared to locally born residents. This is a practical demonstration of self-interest as a driver for migration—see Massey et al. (1993)—as discussed in Section 2. The Rustenburg results, however, paint a different picture. The premium earned by immigrant mineworkers in Rustenburg is notably higher than in the other two towns, while on the other hand, it is the only town of the three where the income of locally born non-mineworkers is higher than the income of immigrant non-mine workers. This observation can potentially be explained by the shorter length of stay of non-mineworkers—reported in Table 1—as well as the diverse nature of the Rustenburg economy as compared to the other two towns.

The above discussion and observations relating to income should also be considered within the context of education levels. The respondents were asked to indicate their highest level of formal education completed. Their answers were converted into years of formal education. For instance, someone completing grade 5 was allocated five years of education, someone with a bachelor's degree was allocated 15 years, etc. Table 3 summarizes the results for the three towns.

³ The Postmasburg survey was done first, two years earlier than the others. Adjusting the Postmasburg income levels for inflation, did not change the observed trends and it was therefore reported in nominal terms.

TABLE 1 Demographic characteristics of locals and migrants at the three mining communities.

	Emalahleni	Rustenburg	Postmasburg
Number of respondents	1,404	1,321	1,480
Locally born	754	771	758
Immigrants	650	550	722
Average age			
Locally born	38.3	43	42.7
Immigrants	35	36	38.2
Length of stay			
Non-mineworkers	13.1	7.6	11.1
Mineworkers	9.8	11.0	7.2

Source: Authors' calculations from survey data.

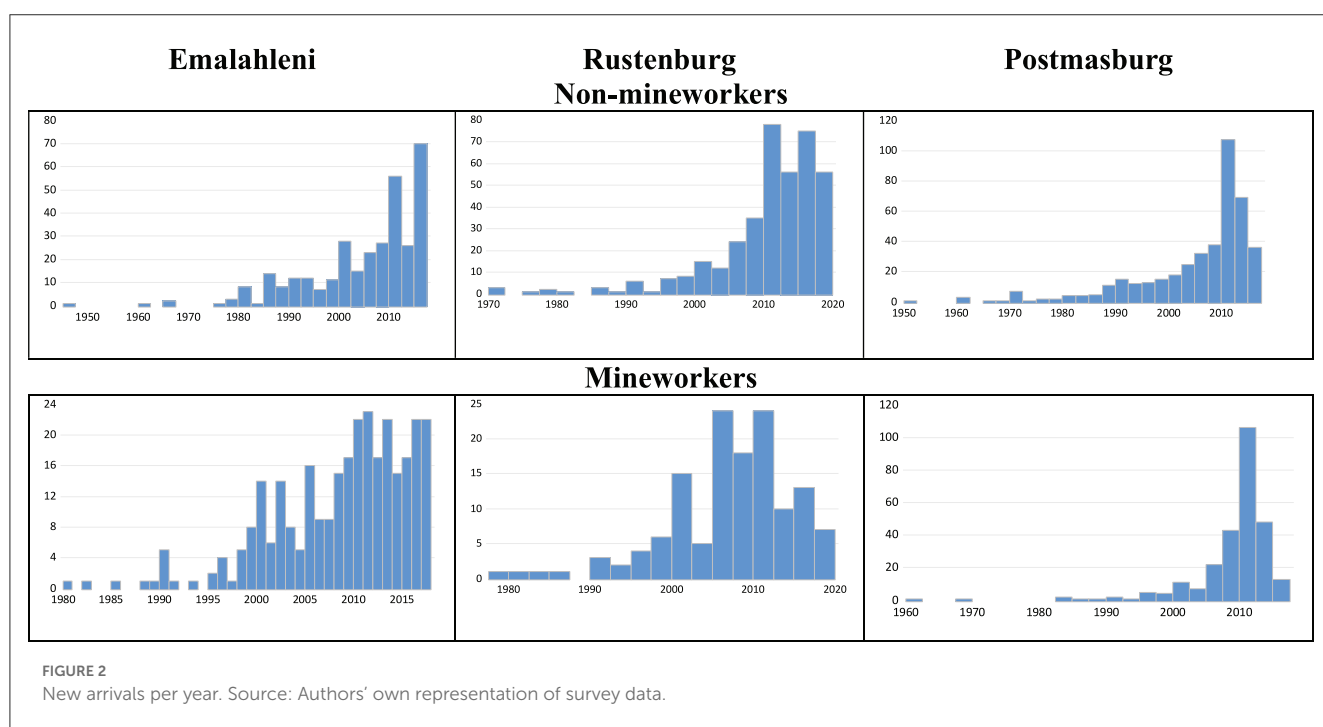


FIGURE 2 New arrivals per year. Source: Authors' own representation of survey data.

TABLE 2 Average income for different categories of respondents.

	Emalahleni	Rustenburg	Postmasburg
Locally born			
Monthly income	16430.71	15256.04	10750.68
Monthly income mineworker	20521.49	17838.24	12603.61
Monthly income non-mineworker	8590.04	8985.00	4541.82
Immigrants			
Monthly income	17895.82	24575.62	10971.85
Monthly income mineworker	20617.73	31982.35	14741.57
Monthly income non-mineworker	11456.91	8175.00	5627.44

Reported income in South African Rand. Nominal values as per survey data. Source: Authors' calculations from survey data.

Comparing the average years of formal education for the three towns, in general, renders two immediate observations. Education levels in Emalahleni are generally higher than in Rustenburg and

Postmasburg. Postmasburg, the most remote of the towns, with the smallest economy, reported the lowest levels. In all three towns, immigrants had more years of formal education when compared

TABLE 3 Years of formal education.

	Emalahleni	Rustenburg	Postmasburg
Average number of years			
• All respondents	11.2	10.2	9.7
• Locally born	11.0	10.1	9.0
• Immigrants	11.3	10.4	10.5
Non-mineworkers	10.6	10.0	9.0
Mineworkers			
• Overall	12.0	10.71	11.3
• Locally born	11.8	10.76	11.0
• Immigrants	12.2	10.66	11.4

Source: Authors' calculations from survey data.

TABLE 4 Regression results explaining monthly earnings.

	Emalahleni	Rustenburg	Postmasburg
Dependent variable: monthly earnings			
Explanatory variables			
Constant	-10149.35	-4503.44	-4528.09
	(0.014)	(0.380)	(0.171)
Education	1774.87	1173.12	1070.91
	(0.000)	(0.014)	(0.001)
Minework	9767.48	9776.74	7528.15
	(0.000)	(0.000)	(0.000)
Locally born	7922.49	914.07	7566.59
	(0.111)	(0.873)	(0.115)
Locally born* Education	-772.46	-9.41	-874.45
	(0.069)	(0.988)	(0.054)
<i>n</i>	624	178	338
R squared	0.251	0.126	0.133
F statistic	53.310	7.397	13.896
Probability of F	0.000	0.000	0.000

Probabilities reported in brackets below estimated coefficients.

Source: Authors' analysis of survey data.

The * symbol indicates that the two variables are multiplied with each other.

to the locally born. However, immigrants to Postmasburg reported slightly higher education levels than immigrants to Rustenburg. Rustenburg, generally, had the most homogeneous group based on education levels.

The second part of Table 3 compares the education levels of mineworkers and those respondents not working for mining companies. Mineworkers in all three towns were more educated than non-mineworkers. Even the locally-born mineworkers were more educated than the non-mineworkers. The one unexpected outcome relates to the education of locally-born vs immigrant mineworkers. In Emalahleni and Postmasburg, the immigrant mineworkers received more years of education than the locally-born ones did. This was, however, not the case in Rustenburg.

In an attempt to link the income levels reported in Table 2 to education levels, three separate regressions were run on the data for each town. Table 4 reports the results. The dependent variable in all three cases is the self-reported monthly earnings of the respondents. The explanatory variables are education measured in years of formal education, minework as a dummy variable with a value of 1 if the respondent did work for a mining company, and locally born as a dummy variable with a value of 1 if the respondent was born in the specific town. Interactive terms referring to locally born mineworkers as well as mineworkers and education were tested but turned out to be not statistically significant and are therefore not reported.

The two explanatory variables, education and minework, display the expected positive signs and are statistically significant

at between 1 and 2% in all three regressions. Each additional year of education adds R1775 to monthly earnings in Emalahleni, R1173 in Rustenburg and R1071 in Postmasburg. Since the survey was run three years earlier in Postmasburg, one could expect the nominal values to be slightly lower. However, if the estimated R1071 is converted to a real value, the calculated R1248 of Postmasburg is very much on par with the marginal values of the other two towns. Mineworkers in general received R9767 more per month in Emalahleni, R9776 in Rustenburg and only R7567 in Postmasburg. The same conversion to real values changes R7567 to R8726—which is still lower than the amounts of around R9770 for the other two towns. The dummy, locally born, displays positive signs in all three regressions and could indicate that locally born residents receive higher income after accounting for place of work and education levels. However, these estimated coefficients are not significant at 10% in any one of them and thus no conclusion can be drawn from it. The one interactive term that did provide a certain level of statistically significant results is locally born times education. For all three towns the estimated coefficients are negative. This is an indication that the extra income rendered from an additional year of education is lower for locally born residents compared to immigrants. This outcome is statistically significant at 6% for Postmasburg and 7% for Emalahleni. Since the estimated coefficient for Rustenburg is not statistically significant at all, the same conclusion cannot be reached for this town. The observed different labor market outcomes in Rustenburg, as reported in Tables 2, 4, can thus be identified as an area in need for further investigation.

The next empirical focus is on the origin and previous place of residence of those persons who migrated to the mining towns. Ogasawara (2021) indicated that most migrants are expected to be internal migrants. This seems to be the case for Postmasburg and to a lesser extent Emalahleni—but not for necessarily for Rustenburg. Table 5 reports on the origin of migrants to the three towns—distinguishing between foreign and South African migrants for the two categories of workers.

For all three towns, the number of foreign migrants is much lower among mineworkers than non-mineworkers. There is therefore no indication that these three mining towns specifically attract potential jobseekers from our neighboring countries—or sources further afield.

Table 5 further confirms the notion of internal migration when applied to provinces. Postmasburg attracts the most migrants from within its own province of the Northern Cape. This applies to both categories of mineworkers and non-mineworkers. Rustenburg, in the North West Province, again is some kind of outlier. Although most migrants come from the North West, there is a significant portion originating from one of South Africa's poorest provinces—the Eastern Cape. This can partly be explained by the longstanding phenomenon of migrant workers that leave their families behind to work in mines located elsewhere in South Africa. This attracted international attention during the Marikana (close to Rustenburg) massacre of 2012 [South African History Online (SAHO), 2013]. Emalahleni also attracts most migrants from within its own province of Mpumalanga. Their northern neighbor of Limpopo is the second most important source, with KwaZulu-Natal, to the east, in third place.

TABLE 5 Migrants' origin.

	Emalahleni	Rustenburg	Postmasburg
Non-mineworkers			
Foreign	19	67	6
Lesotho	1	20	0
Mozambique	9	21	0
Zimbabwe	8	18	0
Other	1	8	6*
South Africa	306	326	447
Western Cape	2	2	27
Eastern Cape	10	91	16
Northern Cape	0	8	298
Free State	7	19	23
KwaZulu-Natal	44	14	5
North West	4	106	47
Gauteng	30	59	20
Mpumalanga	147	8	3
Limpopo	62	19	8
Mineworkers			
Foreign	3	8	3
Lesotho	0	1	1
Mozambique	1	4	1
Zimbabwe	1	0	0
Other	1	3	1
South Africa	308	142	271
Western Cape	1		10
Eastern Cape	12	30	6
Northern Cape	0	8	167
Free state	5	15	20
KwaZulu-Natal	39	6	1
North West	5	47	45
Gauteng	34	23	9
Mpumalanga	139	3	4
Limpopo	73	10	9

Source: Authors' calculations from survey data.

*Four of the six migrants in the "other" originated from Angola.

6. Conclusions and areas for further research

Coderre-Proulx et al. (2016) and the Human Development Report of 2009 [United Nations Development Programme (UNDP), 2009] expressed the need to continue exploring the implications of internal and cross-border in-migration on the labor market of destination areas. This paper contributes to this quest by investigating migration patterns in South Africa by focusing on

three mining towns (Postmasburg, Rustenburg and Emalahleni) in three different provinces. The paper furthermore aimed to determine whether migration patterns observed in these three South African mining towns correspond to patterns observed globally and discussed in theory.

Of these three mining communities, Postmasburg is the only one that experienced recent periods of expansion. Emalahleni and Rustenburg saw significant declines in mining activities in recent times. This is reflected in the significant increase in the number of migrants moving to Postmasburg during 2011 and 2012—corresponding with the expansion of the Kolomela Mine outside Postmasburg. The relatively recent wave (see Figure 2) of new migrants into this town is further reflected in the reported length of stay of migrants. According to the surveys, the average length of stay of migrants in Postmasburg was 7.2 years, compared to 9.8 years in Emalahleni and 11.0 in Rustenburg.

Similar to the observations in Japan of Silvestre (2005) and Ogasawara (2021) in Spain, the largest shares of migrants are internal migrants from other South African provinces. In all three cases, the largest proportion of the internal migrants originated from towns in the same province as the mining community under study.

Our findings support the neo-classical economic notion of self-interest among younger people as a possible motivating factor for migration. In all three towns, the migrants in our samples were significantly younger than the locally-born respondents. These migrants are therefore younger people moving to a new location in a quest to improve their economic wellbeing. Apart from being younger, these migrants also display higher levels of education (see Table 3). The empirical results confirm this positive return on increased education levels. In all three mining communities, the regression results indicate a positive and highly statistically significant return for every additional year of formal education. This return is almost the same for Emalahleni and Rustenburg, while the return of an additional year of education in Postmasburg, the smallest and most rural of three mining communities, is notably lower. In all three towns, the dummy variable included to distinguish between mine workers and non-mineworkers was statically significant and almost the same size in all three regressions. This confirms the general perception that mineworkers in all these communities receive a premium in terms of their monthly earnings—even after controlling for varying levels of education.

As part of a future research agenda, the role of environmental factors as a driver of migration could be investigated in depth in Southern Africa as well. Issues of the environment are recognized more and more as another possible driver of cross-border and internal human migration (Laczko and Aghazarm, 2009; Mastrorillo et al., 2016). The reasoning is that adverse environmental circumstances (e.g., natural disasters, extreme

weather events as well as more gradual aspects of climate change) may, over time, induce people to use migration as an adaptation strategy (McLeman and Smit, 2006; Mastrorillo et al., 2016).

Data availability statement

The datasets used in this study are the intellectual property of the University of the Free State and reasonable requests for access to the data can be directed to the project leaders at the UFS via the corresponding author of this article.

Ethics statement

The studies involving human participants were reviewed and approved by Faculty of Economic and Management Sciences, University of the Free State. The patients/participants provided their written informed consent to participate in this study.

Author contributions

AP conceived and conceptualized the work, analyzed the data, performed the analysis, and actively wrote the paper. DB conceived and conceptualized the work, performed the literature review, and actively wrote the paper. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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