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Rural-urban migration and the well-being of the migrant-sending households: An impact evaluation study

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Background: Rural-urban migration is largely depicted as a household survival strategy, yet rigorous quantitative studies to uncover its impact on the sending households is rare.

Aim: The study aims to assess the causal impacts of rural-urban migration on sending households' economic and subjective well-being (SWB).

Setting: The context of the analysis is South African rural-urban migration using the National Income Dynamics Study panel data.

Methods: A range of methods are used to increase the consistency and precision of estimates, namely: Ordinary Least Squares, Fixed Effects, Difference in Differences, Difference in Differences with Propensity Score Matching and Difference in Differences with instrumental variables, controlling for pertinent issues such as fixed effects, self-selection and endogeneity.

Results: Our econometric analysis reveals a positive correlation between migration and the SWB of the sending household. This effect can be attributed to a range of factors discussed in the study, one of which is the positive association observed between the migration of a household member and the origin household's economic well-being. This upswing in economic well-being is captured by increasing the sending household's monthly income per capita and increased remittance inflows.

Conclusion: From our analysis, we can infer that the improvement in economic well-being offsets the psychological effects of separation, thus leading to the enhanced SWB of the migrant-sending households in South Africa.

Keywords: rural-urban migration; impact evaluation; internal migration; subjective well-being; remittances; South Africa.

Introduction

It is well accepted that rural-urban migration has formed part of South African households' survival strategies (Lehohla 2006), with an annual rate of urbanisation estimated at 2.1% (World Bank 2019). Despite removing the Apartheid era movement restrictions (Bouare 2001), rural-urban migration has remained circulatory due to many migrants preferring to retain ties with their households of origin (Collinson et al. 2003; Posel 2004, 2010). The nature and patterns of rural-urban migration in South Africa is a relatively well-researched issue (Kok & Collinson 2006). However, studies on the consequences of this rapidly increasing migration are more limited in South African literature, and these studies focus on the impact of migration on the migrant itself.

Mbatha and Roodt (2014) explored the labour market outcomes and found that migration improves the probability of employment. Mulcahy and Kollamparambil (2016) found that rural-urban migration in South Africa decreased the subjective well-being (SWB) of the migrant by 8.3%, possibly due to false expectations, increased feelings of isolation, and adapting to a new environment. As much as this is the only published study investigating the effects of rural-urban migration on SWB in South Africa, the sole focus of Mulcahy and Kollamparambil (2016) is on the migrant's well-being. The decision to migrate is usually seen as a household survival strategy (Lehohla 2006), and thus, focusing on the migrant alone does not provide a complete picture of the consequences of rural-urban migration. There is a gap in the literature that looks at the effects of rural-urban migration on the well-being of the sending households.

The most documented channel in global literature, through which rural-urban migration affects the sending household, is remittances (Brown 2006). There is a vast literature on remittances and

how they possibly affect the sending communities in different country contexts (Adepoju 2018; Ajaero & Onokala 2013; Hefti 2003; Nguyen, Raabe & Grote 2015; Rempel & Lobdell 1978). However, these studies are concerned with the impact of remittances on rural inequality and development and do not explore the impact of migration on the migrant-sending households themselves.

Nevertheless, some studies in various country contexts have shown that remittances play a significant role in migrant households' economic well-being, with remittances used for daily transactions, purchasing land, sending children to school, and improving living conditions (Semyonov & Gorodzeisky 2008). In addition to improving the household's economic well-being, remittances can also provide health benefits through better food habits and improved nutritional status (Hadi 1999). However, both of the above studies investigating the effect of remittances are in the context of international migration instead of internal rural-urban migration (Russell 1992; Giuliano & Ruiz-Arranz 2009).

In contrast, some studies show that reliance on remittances can have a negative impact on the well-being of the remaining households. Kothari (2002:16) argued that the remaining households might become 'vulnerable through lack of regular and sufficient remittances and other forms of support from those upon whom they are dependent in various ways but have moved away'. Further, several migrants finance their migration through debt, leaving the sending household members under much financial strain due to the increased debt burden (Dwiyanto & Kebor 1997).

Rural-urban migration and receipt of remittances can also affect the well-being of the sending household through a residual psychological channel (Nguyen, Yeoh & Toyota 2006). The knowledge of having a household member residing in the city could elevate the status of the household in the rural community, thus increasing SWB. Further, rural-urban migration's psychological and social costs as family disruption and prolonged separation usually follow in the wake of migration is equally pertinent (Byerlee 1974; Lu 2012). Depending on the social dynamics of the rural area, family life and gender roles are also shifted by migration (Chant 1998). This shift adds to the household's emotional and physical burden due to added responsibilities and diminished labour supply (Taylor et al. 1996). This is more apparent in areas where agriculture is the main source of livelihood, and the left-behind families are left with additional agricultural & household responsibilities after the migration of family members (De Haas & Van Rooij 2010). These studies make a valuable contribution to our understanding of the left-behind members of migrant households. However, they are not without limitations in terms of addressing serious methodological issues such as selection bias and endogeneity.

Moreover, the economic well-being perspective overlooks the psychosocial costs of rural-urban migration as migration often involves family disruption, reconstruction of household roles and prolonged separation (Budlender & Lund 2011;

Hall & Budlender 2013; Lu 2012). In a more recent study, Ivlevs, Nicolova and Grahams (2019) investigate the effect of international emigration on the SWB of the left-behind. However, the econometric methodology employed does not take into account issues of endogeneity.

This paper aims to fill that gap by investigating the impact of rural-urban migration on migrant-sending households' economic and SWB. The contribution of this paper is two-fold. Firstly, our focus is on the effects of rural-urban migration on the SWB, household income per capita and remittances received by the rural migrant-sending household and secondly, we try to establish a causal effect through a quasi-experimental impact evaluation study design (Gertler et al. 2016). The methodologies employed to root out fixed household-specific characteristics that might bias the results create a counterfactual against which the treated group can be compared and account for endogeneity and selection bias. For these reasons, this study is not only a significant contributor to South African literature, but through its methodological innovation and robustness, it improves upon the existing global literature on rural-urban migration and the sending households.

Theoretical context

In the context of rapid urbanisation in Africa despite high urban unemployment rates, Todaro (1997) highlighted the role of expected income in driving household income strategy. Remittance is the key channel through which the migrant continues to contribute to household income. Various theories have been put forth to explain the motivations behind remittances (Rapoport & Docquier 2005). While altruistic motivation is put forth as one such theory, the circular migration observed in South Africa (Collinson et al. 2003; Posel 2004, 2010) is testimony to the continued relationship of the migrant with the household of origin and therefore indicate contractual motivations such as exchange, insurance and investment as another strategic rationale for remittance.

While it is acknowledged that economic factors fundamentally drive migration decisions in Africa, Byerlee (1974) has presented a theoretical framework that extended decision drivers beyond economic factors. Apart from the economic costs and returns, he included 'psychic' costs and returns of migration in the schematic framework for analysing the migration decision in Africa. The psychic costs, according to Byerlee (1974), emanated from the 'risks' and 'social adjustment' arising from migration.

While Byerlee (1974) highlighted the 'psychic' effects of migration, his framework did not separate the 'psychic' effect on the migrant individual from that of the rural household. The current study argues that the SWB effect of migration on the household of origin can vary from that of the migrant considering that there is less disruption to the social networks for the household as a whole, compared to the risks borne and social disruption experienced by the migrant individual. Therefore, the household's net SWB

returns from migration are likely to be higher than for the migrant. The contribution of this study is in attempting to quantify the net returns and test the postulation regarding the net SWB returns to the migrant-sending household.

The empirical literature has focussed on the economic benefits of migration and employment outcome for the migrant, and to a lesser extent, on the non-economic effects on the migrant in terms of mental/physical health and SWB (Mulcahy & Kollamparambil 2016). The empirical explorations on the effects of migration on the rural household have focussed on the income effect through remittances. The current study extends the effect of migration on the SWB of the migrant-sending household.

Data and descriptive statistics

This study utilises the National Income Dynamics Survey data, the only nationally representative individual-level panel dataset in South Africa. The dataset contains numerous variables pertaining to migration, income, remittances and well-being in South Africa. It is a sample of over 28 000 individuals in 7300 households (Brophy et al. 2018). The survey has been conducted approximately every 2 years, starting from 2008, by the Southern African Labour & Development Research Unit (SALDRU) at the University of Cape Town (Brophy et al. 2018) and tracks individuals over time. We used all five waves in this study and restricted the age of sample members to those above 15 years.

For the analysis, we restructured the dataset into a panel of households. In order to do this, we implemented a method developed by Harris, Collinson and Wittenberg (2017) and Harris (2016). They use a rule-based approach to define:

> [W]hen a given household may be identified as the same observational unit across any two consecutive periods when a given household can be identified to have dissolved after a given period, or when a given household can be identified to be newly formed, i.e. formed between the previous period and current period. (Harris 2016:7)

Following Wittenberg and Collinson (2020), Harris (2016) and Harris et al. (2017), the study identified the same household across waves using two criteria:

- Same dwelling unit across waves.
- There must be an overlap of residents.

In order to track and allocate unique identifiers to households in the dataset, we needed to figure out when new households form and when existing households dissolve. With the help of a National Income Dynamics Survey (NIDS) variable that indicates whether a sample member is a mover or stayer in the current wave, we identified individuals moving in and out of households.

To identify dissolved households, variables were generated that identified 'future movers'- individuals whose status in the next wave is 'mover'. Individuals who stayed in the household after the current wave was identified and termed 'future stayers'. These movers and stayers were counted in every household, and the figures therein were recorded. In the next wave, households that did not comprise at least one 'future stayer' were identified as dissolved households.

The process for identifying newly formed households followed the same process. Using the NIDS variable, 'stayer', we were able to identify individuals that had moved in the previous wave. We termed these 'past movers'. Individuals that did not move since the last wave were labelled 'past stayers'. Households that were comprised entirely of movers and new respondents were identified as newly formed households. Households that were not comprised entirely of movers and new respondents (i.e. had at least one resident stayer) were tagged as continuing/surviving households.

After successfully categorising households in the sample as continuing, newly formed or dissolved households, unique household identifiers were then constructed for each household depending on which category it fell into. Continuing households were allocated their first-wave household ID as their panel ID. Newly formed households took on the household ID of the wave in which they were formed, for example, if a household were formed in the second wave, then its panel ID would be its second wave household ID. All migrants were then dropped from the sample to only remain with household members from the migrant's origin rural-based households.

This rule-based approach was then used to reconstruct the NIDS individual panel dataset into a household panel. Using the newly constructed household panel, the households were divided into a treatment group and a control group containing migrant households and non-migrant households, respectively.

Survey participants were asked to answer the question, 'All things considered, how satisfied are you with your life?' Respondents then ranked their well-being with a value between 1 and 10. These are the values used to compute the average SWB of every household, which was used as one of the dependent variables. The second dependent variable, economic well-being, was denoted by deflated values of household income per capita. The 'remittance' variable was measured by the total remittances received by the sending household. Based on Dolan, Peasgood and White (2008), variables with information about race, gender, marital status, health, employment, income, relative income, safety and remittance are included as control variables. Variables about sanitation conditions are also included as control variables, as these are contributors to the SWB of people (Kollamparambil 2021). Details about how these variables were defined are included in Appendix 1.

We defined a migrant as an individual who has not moved in the first three waves but has moved from a rural to an urban area between the 2nd and 3rd wave (i.e. has a NIDS migration status of 'stayer' for the first two waves and migration status

of 'mover' for the 3rd wave). A non-migrant is an individual who has not moved at all in all five waves.

Consequently, this means that our treatment group was comprised of households where at least one member migrated from a rural to an urban area between waves 2&3, whilst the control group was made up of households in which no members migrated from a rural to an urban area in all five waves. Since the research question is on the effect of rural-urban migration on the well-being of the sending households, urban inhabitants were dropped from the sample to focus on rural dwellers. Individuals who engaged in all other forms of internal migration, namely rural-rural, urban-rural and urban-urban, were also dropped to isolate rural-urban migration.

A glance at Table 1 tells us that migrant households report lower average SWB levels than non-migrant households before and after migration. The average household monthly income per capita for the non-migrant households is also consistently higher than that of the migrant households in both periods. This could indicate self-selection in our sample, where migrants from relatively lower-income and lower SWB households choose to migrate in search of a better life in the city. This further highlights the importance of our econometric analysis that roots out these statistical issues.

The average SWB of the migrant households increases in the post-treatment periods. However, it seems that the SWB of the non-migrant households also follows a similar trend, that is, an increase in the post-treatment period. This provides motivation for the use of econometric methodologies to specifically single out the effect of the migration of a household member on the SWB of the left-behind.

We also discover the same pattern in the change in monthly household income for both groups. Both household types experience an increase in monthly household income per capita. However, there is a significant difference in the magnitude of these increases. The household income of the migrant households increases by 35.89% more than that of the non-migrant households. The migration of a household member does, therefore, result in a higher monthly household income of the migrant households.

Additionally, we note that even though, in our study, the non-migrant households are classified as households that do

not have a household member who participated in rural migration, they still receive remittances from migration that happened prior to our study period.

From Table 2, we find that there are slightly more female migrants than there are male migrants. Black Africans also engage in rural-urban migration more than the other race groups. Statistical analysis is still needed to uncover an unbiased effect of migration on monthly household income from remittances.

Table 3 goes on to track the changes in education and employment of the migrant throughout the waves. In line with expectations, by 2017 (wave 5), 55.77% of migrants were employed. This is a significant improvement from the 30.67% of migrants that were employed prior to migration. It is also worth noting that in the second wave, the period before migration, the number of employed individuals in the treatment group had declined by 12.5%, perhaps indicating an economic shock that would later spur them to migrate to the cities in wave 3.

Nevertheless, the number of the economically inactive migrant population is relatively high, even after migration. Prior to migration, the economically inactive population

TABLE 1: Comparison of outcome variables across waves (Panel sample).

Variable	Sample	Mean		Change (%)
		Pre-treatment	Post-treatment	
Well-being	Treated	3.99	5.06	+26.82
	Control	4.18	5.32	+27.27
Income per capita	Treated	R1776.5	R2060.67	+16.00
	Control	R1823.77	R2072.13	+13.62
Remittances	Treated	R1227.13	R1385.47	+12.90
	Control	R1116.68	R1220.27	+9.28

TABLE 2: Characteristics of migrants.

Variable	%
Rural-urban migrants	
Migrants	2.92
Non-migrants	97.07
Race	
Black people	77.79
Coloured people	11.78
Asian/Indian people	2.55
White people	8.28
Age (at time of migration)	
16–29 years	47.78
30–45 years	30.59
46–59 years	13.38
60 years and above	8.25
Gender	
Female	52.23
Male	47.77

TABLE 3: Changes in employment and education statistics of migrants throughout the waves.

Employment status	Pre-treatment periods		Post-treatment periods		Wave 5 (2017)
	Wave 1 (2008)	Wave 2 (2010)	Wave 3 (2012)	Wave 4 (2014)	
Not economically active (%)	38.38	50	28.57	31.62	32.69
Unemployed (strict + discouraged) (%)	18.45	19.33	26.62	9.40	11.54
Employed (%)	43.17	30.67	44.91	58.97	55.77
Highest level of education obtained					
Primary school (%)	20.06	13.10	13.36	11.27	10.74
High school (%)	57.97	62.88	62.93	54.23	51.24
Higher education (%)	11.78	14.41	15.95	26.06	32.23
No schooling (%)	10.19	9.61	7.76	8.45	5.79

was at 38.38%. By 2017, there was a slight decrease to 32.69%. These statistics support our view that the migration pool does not only consist of individuals seeking employment, but a significant portion of individuals are also migrating to the cities for educational purposes or other reasons unrelated to employment (Kollamparambil 2017).

Table 3 also illustrates a continuous change in the educational outcomes of the migrant. In 2008, 10.19% of migrants reported that they had never had any schooling. By 2017, that number had halved to 5.79%. The number of migrants reporting high school education as their highest form of education also increases slightly over the years. The most significant change, however, can be seen in higher education statistics. By 2017, there was over a 20% increase in the number of migrants who reported having received some form of higher education, compared to the pre-migration period. The slight decrease in the number of migrants with only primary school education makes sense if interpreted together with the subsequent increases in secondary and higher education- as this suggests that some migrants are progressing through the educational levels. This also highlights that education is one of the primary motivators of migration in our sample. These discoveries have implications for how the sending household fares after the migrant's departure.

Econometric models

The effect of rural-urban migration on the sending households' well-being is estimated using five methodologies; Ordinary Least Squares (OLS), Linear Fixed Effects (FE) and Difference in Difference (DID), Difference in Differences with Propensity Score Matching (DID-PSM), and lastly, Difference-in-Differences with instrumental variables (IV-DID).

Ordinary Least Squares

Ordinary Least Squares regression is a basic statistical method commonly used to estimate linear relationships between two variables (Gujarati 2003). It is a naïve approach to impact evaluation, but it is included for comparison. Our model took the following form:

$$Y_i = \beta_0 + \beta_1(\textit{rural-urban migrant}_i) + \beta_2(X_i) + u_i \qquad \text{[Eqn 1]}$$

Where Y is the outcome variable (SWB, monthly household income per capita, monthly household income from remittances) for household i. 'Rural-urban migrant' is a dummy variable denoting whether a household has a migrant or not. The estimates produced by this model have to be interpreted with caution; not only does the model ignore the panel nature of the data, but it also does not consider the unobserved heterogeneity that might be present in the sample. Furthermore, it does not accurately estimate a causal effect due to its inability to construct a counterfactual group. Since our panel data follows a group of households over time, household fixed effects and time effects are present

and might potentially bias the results. Ordinary Least Squares alone cannot root out these effects. Therefore a more robust approach is required.

Fixed Effects

The fixed-effects model roots out the household-specific effects that might be present in panel data. Time invariant effects are eliminated in the Fixed Effects estimation. The model took the form:

$$Y_{it} = \beta_0 + \beta_1(\textit{rural-urban migration})_{it} + \beta_2(\textit{Covariates})_{it} + \Upsilon_t + u_{it} \qquad \text{[Eqn 2]}$$

Although Fixed Effects improves on the OLS method, the model suffers from the same limitation: the absence of a counterfactual against which our hypothesis can be compared. Another disadvantage is that the fixed effects model cannot estimate coefficients for time-invariant variables such as gender, which may be essential in determining well-being. As is the problem with many estimators, unobserved heterogeneity is also not accounted for.

Difference in Differences

An ideal experiment would be a randomised experiment. However, the closest we can get to that standard is using experimental data to emulate a randomised experiment. The Difference-in-Difference regression on the NIDS panel data is used to achieve that. As mentioned, the sample of households was divided into two groups, a treatment and a control group. The treatment group contained migrant households, and the control group contained non-migrant households. A dummy variable, 'Treat', was constructed where a value of 1 denotes households in the treatment group, whilst a value of 0 denotes control group households. A variable, 'Post', indicating treatment periods is also included, where a value of 1 is given to waves 4&5 (post-treatment periods), and a value of 0 is given to wave 3 (pre-treatment period). Waves 1 and 2 were excluded in order to avoid averaging out the pre-treatment effects. The model took the following form:

$$Y_{it} = \beta_0 + \beta_1(\textit{Treat*Post})_{it} + \beta_2(\textit{Treat})_i + \beta_3(\textit{Post})_t + \beta_4(\textit{Covariates})_{it} + u_{it} \qquad \text{[Eqn 3]}$$

Where Y is the outcome variable; 'Treat' indicates whether an individual is in a treatment or a control group, and 'Post' indicates whether a wave falls in the pre-treatment or post-treatment phase. The value of the coefficient of the interaction term reflects the impact of rural-urban migration on well-being. Difference in difference estimation helps us use the observational data to emulate a randomised experiment, thus reducing selection bias.

However, for our DID results to be meaningful, the parallel trends assumption needs to hold. In this context, this means that in the absence of rural-urban migration, the material and SWB of both the treatment and control groups needs to follow the same path. Table 4 shows that

TABLE 4: Parallel trends test results.

Variables	Subjective well-being		Income		Remittances	
	Coefficient	Standard error	Coefficient	Standard error	Coefficient	Standard error
Pre-treatment period 1	-0.441	-0.367	-0.0921	-0.0936	0.563	0.432
Post-treatment period 1	-0.65	-0.461	0.0301	-0.114	0.340	0.424
Post treatment period 2	-0.814*	-0.462	0.152	-0.115	1.130***	0.416
Post-treatment period 3	-0.138	-0.474	0.0825	-0.116	1.797***	0.429
Treat	0.468*	-0.284	0.0506	-0.0794	-0.536*	0.308
Time	-0.890***	-0.053	-0.277***	-0.0127	-0.495***	0.0463
African	-1.047***	-0.0759	-0.384***	-0.0268	0.443***	0.0670
Married	0.0932	-0.0618	0.141***	-0.0185	0.0886	0.0543
Healthy	0.185***	-0.054	0.009	-0.0137	-0.0737	0.0474
Employment	0.0913	-0.0595	0.424***	-0.0153	-0.315***	0.0524
Religious	0.884***	-0.0775	0.0479**	-0.0204	0.187***	0.0682
Education	0.327***	-0.0759	0.182***	-0.0237	-0.0373	0.0666
Age	0.00510**	-0.00204	0.00849***	-0.000601	-0.00469***	0.00182
Household size	0.0958***	-0.0107	-0.116***	-0.00312	0.0762***	0.00945
Housing type	0.186***	-0.0704	0.159***	-0.0191	0.186***	0.0621
Income	0.446***	-0.032				
Gender	0.0983	-0.061	0.111***	-0.017	-0.408***	0.0537
Streetlight	0.160**	-0.0689	0.119***	-0.0182	0.0385	0.0605
Refuse removal	0.121	-0.075	0.163***	-0.0214	-0.105	0.0660
Electricity	0.378***	-0.0761	0.137***	-0.0209	0.215***	0.0671
Flush toilet	0.204***	-0.0681	0.0215	-0.0174	-0.219***	0.0596
Piped water	-0.0146	-0.0681	0.165***	-0.0179	-0.0576	0.0598
Safety	0.245***	-0.0526	0.0387***	-0.0133	-0.0593	0.0462
Constant	0.481*	-0.285	6.469***	-0.062	-0.900***	0.251
Observations	12 030	-	12 030	-	11 771	-
Number of HH_PID	4776	-	4776	-	4629	-

Estimated from NIDS data

*, $p < 0.1$; **, $p < 0.05$; ***, $p < 0.01$.

the assumption holds for all three of our outcome variables. The insignificant pre-treatment coefficients capture this.

Difference in Differences with Propensity Score Matching

Propensity Score Matching is a statistical method that aims to reduce bias by balancing covariates between the treatment and control group and aids us in creating treatment and control groups whose characteristics are as similar as possible. Propensity scores for each household were created through logistic regression. This logistic regression estimated the conditional probability of a household being a migrant-sending household given a set of covariates (household size, the gender of household head, employment status, household income, average age, race, religion). Upon creating propensity scores, observations were matched using the kernel matching algorithm. By utilising PSM, we ensured that the pre-treatment characteristics of both groups were as similar as possible, thus reducing selection bias.

Any differences noticed between the two groups after successfully matching were then purely by chance and not systematic. This similarity in characteristics also means that these two groups will most likely follow parallel trends in the absence of rural-urban migration, thus fulfilling the assumption. After the successful matching, a DID regression was run.

Difference in Differences with Instrumental Variables

Endogeneity bias through simultaneity/self-selection is a serious concern when investigating the effects of rural-urban migration. Lower subjective or economic well-being scores of the migrant's origin household might have spurred a migrant's decision to migrate. Confounding factors might also bias our results and produce spurious results. Other sources of endogeneity, such as measurement error and omitted variable bias, are likely to be present and need to be controlled for. Neither of the models we have listed above sufficiently address this issue. As much as DID and DID-PSM construct a counterfactual group, they also fail to deal with the critical issue of endogeneity and do not deal with the effects of unobserved heterogeneity.

For this reason, we set out to utilise DID with IV. The IV regression is a statistical method that allows us to get consistent estimates even in the presence of omitted variables. These consistent estimates can only be observed in the presence of appropriate IVs. Good IVs satisfy two properties:

- Instrument relevance: a good instrument should be correlated with the outcome variable.
- Instrument validity/ exclusion restriction: it should not be correlated with any other determinants of the dependent variable.

Using these guidelines, we chose municipal gross domestic product (GDP) per capita as one of the instruments for the migration of a family member when investigating the impact of rural-urban migration on SWB. The migration literature has well documented (Hare 1999; Parkins 2010) that migration decisions are often caused by push and pull factors in the origin and destination places, respectively. If a municipality has a low GDP per capita, this speaks to potentially low economic activity in that region, which might push residents to migrate to places where their economic well-being is secure.

Our second IV is the average yearly rainfall per municipality. Weather shocks have been proven in international migration literature to be correlated with the decision to migrate (Warner et al. 2012). In migration literature, worldwide, people tend to migrate from drier areas to areas with more favourable conditions (Gray 2010; Warner et al. 2012). Rainfall is, therefore, a suitable IV for migration in our study as it is strictly exogenous and not correlated with any determinants of migration that we did not control for. It is only correlated

with either subjective or economic well-being through the decision to migrate. Furthermore, the first stage regression displays a strong positive and significant link between the migration of a household member and the quantity of municipal rainfall. Therefore, this makes us confident in the use of average rainfall as an instrument for rural-urban migration.

Two-stage least squares were utilised in the IV regression. The first stage regression was run to estimate the impact of the IVs on the endogenous independent variable. The equation took the form:

$$Treatment_{it} = \alpha_0 + \alpha_1 (Instruments)_{it} + \alpha_4 (Covariates)_{it} + u_{it} \quad [Eqn\,4]$$

Where 'treatment' is binary and refers to the migration of a household member and 'instruments' is municipal GDP per capita and municipal yearly rainfall. As our endogenous treatment variable is binary, instead of OLS being utilised in the first stage regression, we use Maximum Likelihood Logit Estimation. The probability of treatment was then predicted from the first stage regression.

In the second stage of regression, the predicted values of the probability of treatment is used as the treatment variable, as illustrated in the model below:

$$Y = \beta_0 + \beta_1(Treat^*Post) + \beta_2[\alpha_0 + \alpha_1 (Instruments) + \alpha_4(Covariates) + u] + \beta_3(Post) + \beta_4(Covariates) + u \quad [Eqn\,5]$$

Results
Subjective well-being

We first assess the results of the impact of migration on SWB. The first three models displayed in Table 5 depict the impact of migration to be consistently insignificant. However, after controlling for self-selection and applying a comparison group using DID with PSM, the relationship between the origin household's SWB and the migration of a household member is revealed to be positive and significant (*TreatHH*Post*). This corroborates the descriptive statistics displayed in Table 1. According to the DID-PSM model, the migration of a household member leads to a 0.32 increase in the sending household's average SWB. After controlling for endogeneity and confounding factors using DID with IVs, the migration of a household member is seen to lead to a 0.59 increase in the origin household's SWB. Evidently, in our previous models, simultaneity, measurement error, and omitted variable bias/ confounding factors were crowding out the effect of migration on the sending household's SWB.

The increase in SWB can be attributed to a variety of factors and channels. Nguyen et al. (2006) argues that knowledge of having a household member residing in the city can lead to an increase in the origin household's SWB through a residual psychological channel. The presence of a city-dwelling household member might lead to an elevation of the sending

TABLE 5: Impact of migration on household's subjective well-being.

Variables	OLS		Fixed effects		DID		DID-PSM		IV-DID	
	Coefficient	Standard error	Coefficient	Standard error	Coefficient	Standard error	Coefficient	Standard error	Coefficient	Standard error
TreatHH*Post	-	-	-	-	-0.249	0.335	0.321***	0.122	0.589***	0.104
TreatHH	-	-	-	-	0.252	0.265	-0.423***	0.0918	-0.235**	0.118
Post	-	-	-	-	0.908***	0.0544	1.005***	0.103	0.643***	0.0743
Migration	-0.00138	0.205	-0.184	0.411	-	-	-	-	-	-
African	-1.152***	0.0698	-0.0767	0.581	-1.090***	0.0702	0.409**	0.0582	-1.109***	0.0715
Married	-0.00186	0.0592	-0.273**	0.124	-0.00526	0.0596	0.129	0.0969	-0.0149	0.0600
Relative income	0.389***	0.0283	0.318***	0.0374	0.392***	0.0285	0.062	0.0454	0.401***	0.0285
Health	0.208***	0.0542	0.166**	0.0688	0.205***	0.0546	-0.015	0.0898	0.218***	0.0547
Employment	0.140**	0.0590	0.107	0.0847	0.0920	0.0593	0.053	0.1006	0.119**	0.0601
Religious	0.783***	0.0781	0.631***	0.109	0.826***	0.0786	-0.080	0.1147	0.823***	0.0792
Education	0.240***	0.0716	0.342**	0.171	0.255***	0.0721	-0.097	0.1034	0.265***	0.0722
Age	0.00674***	0.00200	0.0129***	0.00409	0.00696***	0.00201	-0.0007	0.0003	0.00738***	0.00200
Household size	0.0775***	0.0103	0.0909***	0.0231	0.0853***	0.0103	0.048***	0.0142	0.0865***	0.0104
Housing type	0.183***	0.0696	0.158	0.107	0.156**	0.0701	0.023	0.0999	0.121*	0.0707
Income	0.323***	0.0323	0.177***	0.0551	0.330***	0.0325	-0.085	0.0536	0.324***	0.0328
Female	0.177***	0.0596	0.217**	0.0981	0.155***	0.0600	-0.152	0.1019	0.158**	0.0618
Safety	0.190***	0.0531	0.272***	0.0670	0.232***	0.0534	-0.069	0.0907	0.228***	0.0540
Streetlight	0.126*	0.0683	0.0254	0.0978	0.151**	0.0688	0.008	0.1359	0.165**	0.0693
Refuse removal	0.150**	0.0729	0.208	0.139	0.112	0.0734	-0.334*	0.1398	0.173*	0.0962
Electricity	0.275***	0.0751	0.415***	0.117	0.283***	0.0756	0.235***	0.1017	0.235***	0.0758
Flush toilet	0.135**	0.0682	-0.0182	0.0889	0.203***	0.0685	0.020	0.1217	0.227***	0.0709
Piped water	-0.0800	0.0675	0.0465	0.0964	-0.0527	0.0680	-0.07	0.0907	0.00184	0.0690
Constant	0.357	0.270	0.882	0.697	-0.369	0.266	4.196***	0.0775	-0.308	0.272
Observations	11 552	-	11 552	-	11 552	-	11 012	-	11 820	-
R-squared	0.187	-	0.089	-	0.174	-	0.046	-	0.178	-
Number of HH_PID	-	-	4615	-	-	-	-	-	-	-

Estimated from NIDS data

OLS, ordinary least squares; PSM, propensity score matching; DID, difference in differences; IV, instrumental variables.

*, p < 0.1; **, p < 0.05; ***, p < 0.01.

household's status in the community. As discussed in the literature review, family life and gender roles could experience a shift due to migration (Chant 1998). This reconstruction of gender roles is likely to benefit the 'left-behind' women (Yabiku, Agadjanian & Sevoya 2010). Parreñas (2008) and Yabiku et al. (2010) suggest that this may be caused by the women's increased decision-making power and newly found autonomy due to their husbands' absence.

Similar to the evidence provided by (Cummins 2000), our regression results in Table 5 consistently show a positive and significant association between income and SWB. The positive and significant coefficient of the *TreatHH*Post* variable in the IV-DID model indicates a net positive SWB benefit from migration on the migrant-sending household.

As expected from the literature (Kollamparambil 2021), our results show that being a black African household negatively correlates with SWB. Variables that have been proven in the literature to affect well-being are also shown to be consistently significant in our models. Predictably, there is a positive correlation between health and SWB.

Being religious is also significant and positive in four models, endorsing the numerous findings that depict a positive relationship between religious involvement and life satisfaction levels (Ellison 1989; Witter et al. 1985). An increase in household size also leads to an increase in well-being across all models consistently. This may be due to a more extensive support system for each household member,

putting them in a position where they can better cope with the emotional effect of the migration of a household member (Figley 1983). The result that the presence of streetlight electricity and a flush toilet is also positively correlated to an increase in SWB is in line with existing studies (Bookwalter & Dalenberg 2004; Kollamparambil 2021).

Income

Table 6 reports the impact of migration on household per capita income. While OLS, FE, and basic DID, estimations did not report a significant correlation between a household member's migration and the sending household's income per capita, the more robust DID estimation after matching on observable covariates using PSM and accounting for endogeneity yields a positive and significant relationship. This is indicative of the self-selection of migrants/migrant households into the treatment group and the presence of endogeneity through reverse causality.

A household member's migration increases the household's income by 11%, according to the PSM-DiD, but the IV-DID estimation indicates that the impact is lower at a 5% increase in the household's income per capita. The positive effect of migration on income is heavily supported by research investigating the same relationship in other parts of the world (Taylor & Lopez-Feldman 2010).

There could, however, be two channels through which the per capita income of sending family increases. The main channel cited in the literature, through which the left

TABLE 6: Impact of migration on the sending household income per capita (log).

Variables	OLS		Fixed effects		DID		DID-PSM		IV-DID	
	Coefficient	Standard error	Coefficient	Standard error	Coefficient	Standard error	Coefficient	Standard error	Coefficient	Standard error
TreatHH*Post	-	-	-	-	0.0504	0.0971	0.111**	0.0406	0.0503*	0.0303
TreatHH	-	-	-	-	-0.0729	0.0760	-0.267***	0.0301	0.322***	0.0342
Post	-	-	-	-	0.275***	0.0159	0.271***	0.0340	0.228***	0.0217
Migration	-0.0268	0.0607	0.0225	0.0842	-	-	-	-	-	-
African	-0.280***	0.0206	0.183	0.126	-0.274***	0.0206	0.458***	0.1764	-0.325***	0.0207
Married	0.159***	0.0174	0.0379	0.0267	0.155***	0.0175	0.0921	0.0932	0.138***	0.0173
Healthy	0.0481***	0.0161	0.00169	0.0148	0.0468***	0.0161	-0.0558	0.0870	0.0468***	0.0159
Employment	0.506***	0.0169	0.322***	0.0179	0.510***	0.0169	0.0044	0.0941	0.541***	0.0168
Religious	0.0760***	0.0229	0.0120	0.0233	0.0763***	0.0230	-0.112	0.106	0.0257	0.0228
Education	0.188***	0.0211	-0.0301	0.0366	0.195***	0.0212	-0.1025	0.0996	0.221***	0.0208
Age	0.0109***	0.000582	0.00324***	0.000874	0.0113***	0.000581	-0.0025	0.0032	0.0115***	0.000569
Household size	-0.117***	0.00283	-0.0820***	0.00487	-0.117***	0.00283	0.0541	0.0126	-0.120***	0.00279
Housing type	0.178***	0.0206	0.0853***	0.0230	0.179***	0.0206	0.0494	0.09570	0.136***	0.0204
Female	0.148***	0.0176	0.0320	0.0211	0.153***	0.0176	-0.1637*	0.0979	0.194***	0.0177
Safety	0.0843***	0.0158	0.0140	0.0144	0.0803***	0.0157	-0.0694	0.0875	0.0518***	0.0156
Electricity	0.121***	0.0222	0.0824***	0.0252	0.130***	0.0222	0.0119	0.0975	0.0982***	0.0219
Flush toilet	0.0511**	0.0203	-0.0332*	0.0192	0.0472**	0.0203	0.0304	0.1356	0.108***	0.0206
Piped water	0.297***	0.0198	-0.0176	0.0207	0.297***	0.0199	-0.0789	0.1159	0.331***	0.0198
Refuse removal	0.103***	0.0217	0.0507*	0.0299	0.103***	0.0217	-0.3657	0.1349	0.307***	0.0280
Streetlight	0.146***	0.0202	0.0375*	0.0210	0.147***	0.0203	0.001	0.1299	0.179***	0.0200
Constant	6.140***	0.0615	6.842***	0.126	5.774***	0.0579	6.551***	0.0257	5.587***	0.0602
Observations	11 771	-	11 771	-	11 771	-	11 365	-	12 041	-
R-squared	0.432	-	0.178	-	0.429	-	0.038	-	0.434	-
Number of HH_PID	-	-	4629	-	-	-	-	-	-	-

Estimated from NIDS data

OLS, ordinary least squares; PSM, propensity score matching; DID, difference in differences; IV, instrumental variables.

***, $p < 0.01$; **, $p < 0.05$; *, $p < 0.1$.

behind's household income increases, is remittances (Byerlee 1974; Todaro 1997). Nonetheless, the household's income, independent of remittances, can also increase due to the reduction in the household size (Datta & Meerman 1980). If the migrant was not the primary breadwinner of the house, his departure might increase the household's income, seeing as there are fewer people to survive on a fixed income.

As we have deciphered from the descriptive statistics displayed in Table 3, 70% of migrants reported being unemployed or economically inactive in the period prior to migration. Logically, the migration of individuals that fall within these brackets, unemployed and inactive in the labour market (Afsar 2002; Tsegai 2007), would leave the sending household economically better off, as there are fewer individuals to support on a fixed household income. Once the migrant is settled in the city, the cash inflows from remittances would lead to further improvement in the sending household's economic well-being.

Remittances

Next, we attempt to understand the impact of migration on the receipt of remittances by the sending household (Table 7). Ordinary Least Squares reports that the outmigration of a household member is significantly associated with a 0.5% increase in the value of the remittances received by the origin household. After controlling for household fixed effects by running the fixed effects regression, this figure shoots up to 1.23%. The DID regression, which creates a comparison group, downsizes this increase to 0.75%. After controlling for self-selection using PSM DID, however, we get an insignificant result. Controlling for endogeneity reaffirms the positive impact of migration on remittance receipt, highlighting that confounding factors confirm the results from the first three models- the rural-urban migration of a household member is correlated with an increase in the value of the remittances received by the sending household at 0.39%.

The increase in remittance inflows is not a surprising result, as the prospect of remitting is often a key element in the decision to migrate. Hagen-Zanker (2015) showed that the more integrated migrants are in the labour system, the more likely they are to remit. As we have deciphered from Table 3, only 30% of migrants reported being involved in some type of employment in the period prior to migration, but by 2018 after migration, this number had increased to 56%, further improving the migrant's chances of remitting.

Furthermore, (Niimi, Pham & Reilly 2009) also provided evidence that illustrated how, among other things, the vulnerability of a migrant's life at the destination, their link to relatives back home, and the time spent at the destination affect remittances. This evidence combined with the temporary migration pattern in South Africa adds weight to the theory that migrants act as risk-averse economic agents and send remittances back to the household of origin as part of an insurance exercise in the face of economic uncertainty (Niimi et al. 2009).

TABLE 7: Impact of migration on the value of remittances received by the sending household.

Variable	OLS		Fixed effects		DID		DID-PSM		IV-DID	
	Coefficient	Standard error	Coefficient	Standard error	Coefficient	Standard error	Coefficient	Standard error	Coefficient	Standard error
TreatHH*Post	-	-	-	-	0.748***	0.287	0.137	0.107	0.386***	0.0898
TreatHH	-	-	-	-	-0.223	0.225	0.266***	0.0825	-0.202**	0.102
Post	-	-	-	-	0.515***	-	0.457***	0.0904	0.330***	0.0646
Migration	0.504***	0.179	1.231***	0.329	-	-	-	-	-	-
African	0.408***	0.0613	0.909*	0.493	0.421***	0.0615	0.439**	0.1774	0.422***	0.0619
Married	0.140***	0.0516	-0.0968	0.104	0.115**	0.0519	0.102	0.0937	0.106**	0.0513
Healthy	-0.0588	0.0474	-0.0981*	0.0579	-0.0656	0.0477	-0.056	0.0870	-0.0708	0.0471
Employment	-0.360***	0.0517	-0.200***	0.0715	-0.335***	0.0519	0.042	0.0989	-0.329***	0.0519
Religious	0.195***	0.0675	0.171*	0.0911	0.186***	0.0679	-0.103	0.1066	0.185***	0.0676
Education	-0.0719	0.0624	0.0759	0.143	-0.0494	0.0628	-0.089	0.0998	-0.0444	0.0619
Age	-0.00693***	0.00174	-0.00216	0.00342	-0.00539***	0.00175	-0.0016	0.0032	-0.00531***	0.00171
Household size	0.0704***	0.00892	0.131***	0.0194	0.0704***	0.00897	0.048***	0.0032	0.0674***	0.00889
Housing type	0.196***	0.0607	0.0879	0.0900	0.203***	0.0611	0.0619	0.0961	0.194***	0.0608
Female	-0.458***	0.0521	-	-	-0.430***	0.0523	-0.1540	0.0984	-0.429***	0.0527
Street light	0.0383	0.0597	0.115	0.0821	0.0306	0.0601	0.010	0.1302	0.0300	0.0596
Refuse removal	-0.114*	0.0639	-0.0492	0.117	-0.101	0.0642	-0.356***	0.1355	-0.0872	0.0834
Electricity	0.168**	0.0655	0.188*	0.0985	0.207***	0.0659	0.014	0.0974	0.180***	0.0651
Flush toilet	-0.163***	0.0598	-0.248***	0.0751	-0.202***	0.0600	0.0371	0.1365	-0.197***	0.0611
Piped water	-0.0306	0.0590	-0.0494	0.0810	-0.0460	0.0594	-0.068	0.116	-0.0350	0.0594
Safety	-0.0150	0.0465	-0.0534	0.0564	-0.0484	0.0466	-0.067	0.0876	-0.0503	0.0464
Constant	-0.0955	0.246	-3.616***	0.587	-1.132***	0.233	0.693***	0.0699	-0.999***	0.234
Observations	11 771	-	11 771	-	11 771	-	12 292	-	12 041	-
R-squared	0.062	-	0.065	-	0.050	-	0.014	-	0.050	-
Number of HH_PID	-	-	4629	-	-	-	-	-	-	-

Estimated from NIDS data

OLS, ordinary least squares; PSM, propensity score matching; DID, difference in differences; IV, instrumental variables.

***, $p < 0.01$; **, $p < 0.05$; *, $p < 0.1$.

Discussion

This study set out to investigate the association between the rural-urban migration of a household member and the subjective & economic well-being of the origin household. In a country where urbanisation is rapidly on the rise, it is of utmost importance that we understand how this inevitable process affects the population. As much as the South African literature on rural-urban migration is emerging, it often focuses on the migrant and ignores the migrant's origin household (Mbatha & Roodt 2014; Mulcahy & Kollamparambil 2016). However, the research is often also conducted at an individual level. In global literature, there is a need for an empirically sound analysis on the effects of rural-urban migration on the sending households, which is what this study has successfully achieved.

The results are based on five estimation techniques that increase precision and robustness and account for pertinent issues such as reverse causality and fixed effects. From the results laid out in the preceding section, we confidently conclude that rural-urban migration has a significantly positive effect on the SWB of the left-behind household. This is in contrast to the migrant's declining SWB reported in Mulcahy and Kollamparambil (2016).

A plausible explanation for improving the households' economic well-being is increased monthly household income per capita and remittance inflows. Our descriptive statistics reveal that most migrants in our sample migrate from their origin household to the city in search of either work or education. This suggests another channel, in addition to remittances, through which the sending household's monthly income per capita increases. If the school-going, unemployed and non-labour participant household member migrates, then this would lead to an increase in household income per capita in the sending household. The household income that was previously used to cater to a relatively larger group would now be distributed amongst a smaller group, thus increasing the household income per capita.

The increase in remittance inflows could result from the migrants' integration into the labour market, as depicted by the descriptive statistics. There is also evidence that temporary migrants are more likely to remit as a form of insurance against economic uncertainty (Niimi et al. 2009). This could be one of the reasons for the increase in remittances observed in our study, as South Africa's migration patterns have since been discovered to be temporary (Posel 2004).

Conclusion

The study has shown that the net SWB returns to migration for the sending-household are positive, despite the negative SWB effect on the migrant (Mulcahy & Kollamparambil 2016). By providing an in-depth econometric household-level analysis of the effects of rural out-migration on the sending household, we hope to have provided a much-needed viewpoint on the effects of rural-urban migration on the rural population.

Acknowledgements

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Appendix 1

Variable definitions

Dependent variables

- **Subjective well-being:** average subjective well-being of all the household members, scale 1–10
- **Household income per capita:** log of Household income divided by the number of members, deflated using 2012 values
- **Remittance:** log of Money received by household as remittance, deflated using 2012 values

Covariates

- **TreatHH:** 1 – if the household has an individual that has migrated from a rural area to an urban area between waves 2&3, 0 – if not
- **Post:** 1 – if the wave is 3,4, or 5 and 0 – if the wave is 1 or 2
- **Migration**-1-household after migration of its member, 0 – otherwise
- **Female:** 1 – female, 0 – male, household head
- **Marital status:** 1 if the household head is married or cohabiting, 0 otherwise
- **Religious:** 1 – if religion is of importance to the household head, 0 – otherwise
- **Health:** 1 – if the perceived health status of household head ranges from excellent to fair,0 – otherwise
- **Employment:** 1 – if the household head is employed, 0 – otherwise
- **Education:** 1 – if the household head received at least Matric level schooling, 0 – otherwise
- **Age:** 1: 0–17 years, 2: 18–20 years, 3: 21–29 years, 4: 30–45 years, 5: 60 years and above for household head
- **Housing type:** 1 – if the house is formal, 0 – if the dwelling is informal
- **For variables; street light, refuse removal, electricity, flush toilet, and piped water:**
  If the facility is present, 0 – otherwise
- **Safety:** 1 – If the respondent reported feeling safe, 0 – Otherwise