



# *The Impact of Mobile Phones on Change in Employment Status in South Africa*

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# Motivation

- One of the key problems of the labour market in South Africa is the spatial distribution of supply and demand for labour.
- Search costs and limited access to information make it difficult for people living in rural areas to find jobs.
- Mobile devices are the most popular means of accessing the Internet with 64% of South African households using mobile broadband, as compared to 8.3% that access the Internet using fixed broadband at home.\*
- We study whether change in employment status over time can be attributed to some extent to ownership of mobile phones.

\*Using mobile devices to access the Internet includes access on mobile phones and on other devices via 3G or 4G SIM cards

# Literature Review

- **Economic impact of mobile phones in developing countries**
  - **Jensen (2007)**: Mobile phone adoption by fishermen led to better price discovery and adherence to the law of one price.
  - **Aker and Mbiti (2010)**: Day laborers in Niger can call acquaintances in Benin about job opportunities. In Malawi text messages are used to remind patients to take their HIV/AIDS medication. In Kenya, violent confrontations can be reported via text message.

# Literature Review

- **Internet and labour markets in developed economies**

- **Autor (2001)**: Job openings can reach a much wider audience by reducing search costs.
- **Kuhn and Skuterud (2004)**: Internet job search does not reduce unemployment duration.
- **Kroft and Pope (2014)**: The expansion of an online job site (Craigslist) in the US did not affect employment.
- **Kuhn and Mansour (2014)**: By using more recent data than Kroft and Pope (2014), the authors find that searching for work online decreased unemployment duration by 25%.
- **Ivus and Boland (2015)**: Broadband deployment promotes employment in rural areas and not in urban areas.

# Literature Review

- **Internet and labour markets in developed economies**

- **Dettling (2017)**: Married women with access to high-speed internet are more likely to join the labour force relative to men and single women.
- **Akerman et al. (2015)**: Broadband Internet adoption in firms complements skilled workers and substitutes for unskilled worker.

# Literature Review

- **Mobile phones and labour markets in developing economies**

- Studies on the impact of mobile coverage on labour markets in developing countries are scarce.
- **Klonner and Nolen (2010)**: Finds that the roll-out of mobile networks in rural areas in South Africa has a positive impact on employment. In localities which moved from no coverage to full coverage, employment increased by 15 percentage points.
- **Bahia et al. (2020)**: Greater mobile broadband coverage in Nigeria increases household consumption and reduces poverty. They attribute these results to increased labour force participation and wage-based employment.

# Data

- National Income Dynamics Survey (NIDS) from 2008 to 2017.\*
- Tracks individuals and not households over time.
- Data from adult, proxy and household questionnaires were used.
- Adults are those aged 15+
- Proxies refers to adults that were not available during the interview.

\* W1=2008, W2=2010/11, W3=2012, W4=2014/15 and W5=2017

Table 1: Successfully interviewed households and adults across all five waves

	Households	Adults
Wave 1	7,296	17,381
Wave 2	6,781	18,725
Wave 3	8,031	21,399
Wave 4	9,615	24,334
Wave 5	10,842	25,813

Note: Successful proxy interviews are included in the adults column

# Data

- Employment status
  - Becoming employed: 0 = remains unemployed from  $W_t$  to  $W_{t+1}$ , 1 = employed in  $W_{t+1}$ .
  - Becoming unemployed: 0 = remains employed from  $W_t$  to  $W_{t+1}$ , 1 = unemployed in  $W_{t+1}$ .
  - Unemployed individuals include discouraged and strictly unemployed.
- Mobile phones
  - Mobile phone ownership is a binary variable.
  - Mobile phone adoption increased from 57% in W1 to 80% in W5.
  - Internet users in South Africa increased from 8% in 2008 to 68% in 2019.
  - No distinction between smartphone and feature phone ownership.



# Data

- Figure 1: Greater share of adults with mobile phones shifted from being unemployed to employed than those without mobile phones.
- Figure 2: A greater share of individuals without a mobile phone lost employment compared to those who own a mobile phone.

Figure 1: Proportion of adults who became employed over time by mobile phone ownership

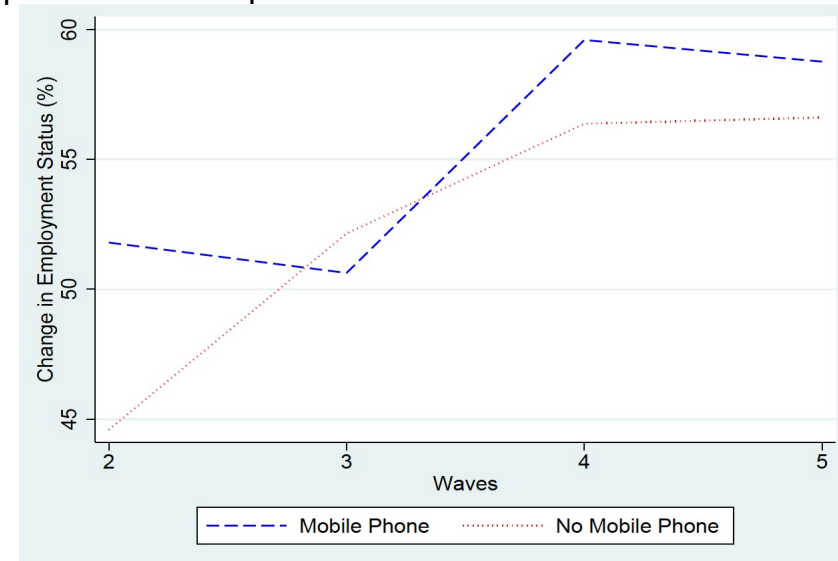
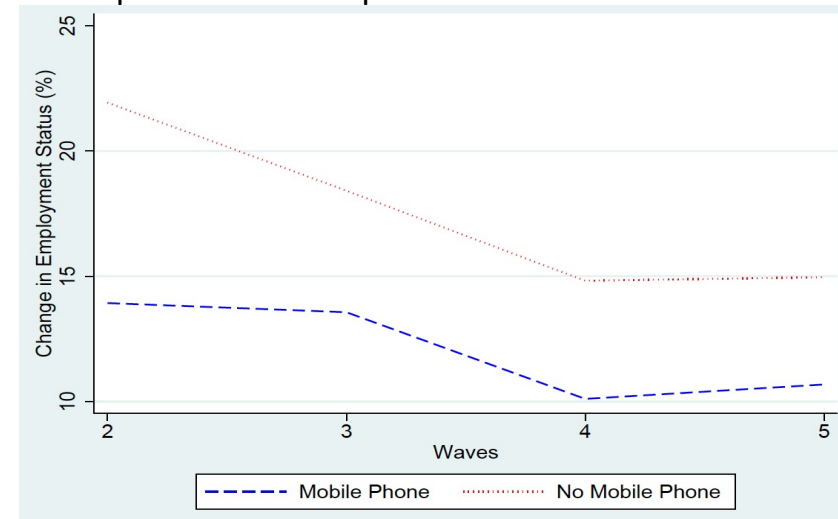


Figure 2: Proportion of adults who became unemployed over time by mobile phone ownership



# Data

Table 2: Summary statistics of adults who remained unemployed and those who became employed.

Variables	Remain unemployed		Become employed	
	Mean	Std	Mean	Std
Mobile Phone	0.714	0.452	0.753	0.431
Female	0.646	0.478	0.538	0.499
Age	29.3	9.1	30.9	9.7
<i>Race</i>				
African	0.890	0.313	0.853	0.354
White	0.004	0.060	0.007	0.083
Coloured	0.100	0.300	0.134	0.340
Asian/Indian	0.006	0.080	0.006	0.079
<i>Education</i>				
<Primary	0.111	0.314	0.112	0.316
Primary	0.619	0.486	0.547	0.498
Secondary	0.205	0.403	0.226	0.418
Tertiary	0.065	0.247	0.115	0.319
<i>Health</i>				
Poor-fair	0.077	0.267	0.064	0.244
Good-Very Good	0.547	0.498	0.545	0.498
Excellent	0.376	0.484	0.391	0.488
Household Computer	0.065	0.247	0.094	0.292
Computer Literate	0.288	0.453	0.351	0.477
<i>Geographic Location</i>				
Urban	0.457	0.498	0.534	0.499
Non-Urban	0.543	0.498	0.466	0.499
<i>Province</i>				
Western Cape	0.060	0.237	0.103	0.304
Eastern Cape	0.137	0.344	0.111	0.314
Northern Cape	0.081	0.273	0.084	0.278
Free State	0.063	0.243	0.073	0.260
KwaZulu Natal	0.290	0.454	0.246	0.431
North West	0.087	0.282	0.067	0.251
Gauteng	0.109	0.312	0.135	0.342
Mpumalanga	0.081	0.273	0.085	0.279
Limpopo	0.092	0.289	0.095	0.293
Observations	2,474		3,013	

Table 3: Summary statistics of adults who remained employed and those who became unemployed.

Variables	Remain employed		Become unemployed	
	Mean	Std	Mean	Std
Mobile Phone	0.851	0.356	0.777	0.416
Female	0.482	0.500	0.528	0.499
Age	37.6	10.7	32.7	10.2
<i>Race</i>				
African	0.746	0.435	0.819	0.385
White	0.045	0.207	0.008	0.092
Coloured	0.195	0.397	0.164	0.371
Asian/Indian	0.014	0.117	0.008	0.089
<i>Education</i>				
<Primary	0.144	0.352	0.134	0.341
Primary	0.446	0.497	0.577	0.494
Secondary	0.191	0.393	0.191	0.393
Tertiary	0.219	0.413	0.098	0.298
<i>Health</i>				
Poor-fair	0.080	0.271	0.096	0.294
Good-Very Good	0.571	0.495	0.539	0.499
Excellent	0.349	0.477	0.365	0.482
Household Computer	0.205	0.404	0.096	0.294
Computer Literate	0.438	0.496	0.333	0.471
<i>Geographic Location</i>				
Urban	0.649	0.477	0.562	0.496
Non-Urban	0.351	0.477	0.438	0.496
<i>Province</i>				
Western Cape	0.175	0.380	0.134	0.341
Eastern Cape	0.085	0.279	0.112	0.315
Northern Cape	0.082	0.275	0.081	0.273
Free State	0.070	0.256	0.066	0.248
KwaZulu Natal	0.208	0.406	0.260	0.439
North West	0.060	0.238	0.060	0.237
Gauteng	0.169	0.374	0.125	0.331
Mpumalanga	0.083	0.276	0.087	0.282
Limpopo	0.067	0.250	0.075	0.263
Observations	13,855		2,003	

# Econometric Methods

- We estimate a probit model with a binary dependent variable (change in employment status).
- The probability of a change in employment status is explained by a vector of individual and household characteristics.
- We allow for unobservable heterogeneity by means of individual random effects.
- The panel data set is unbalanced because we lose some individuals over time and new ones join the sample.

# Identification (Endogeneity)

- Potential concern over endogeneity if mobile phone ownership is correlated with the error term.
- Mobile phone ownership is unlikely to be correlated with employment in the future.
- It's reasonable to assume that people do not get a phone in anticipation of becoming employed in 1-2 years.
- We find that there is a difference in the type of people who are early mobile adopters (i.e., women, tertiary educated and urban dwellers).
- We include a rich set of observable characteristics in our model.
- We also run a random effects model to account for unobserved characteristics that correlate with having a phone and becoming employed.

# Results

- Mobile phone has a positive impact on employment status.
- Having a computer in the household and computer literacy are both statistically insignificant.
- Women are less likely to be employed.
- No difference between race groups.
- Education increases your chances of becoming employed.
- Individual health and geographic location plays a role in employment.

Table 4: Estimation results of owning a mobile phone and becoming employed

Variables	Probit Model			Probit Model with Random Effects		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Mobile phone	0.070*	0.077*	0.164**	0.070	0.078*	0.164*
	(0.041)	(0.042)	(0.077)	(0.046)	(0.046)	(0.085)
Home computer		0.062	0.061		0.072	0.071
		(0.069)	(0.069)		(0.077)	(0.077)
Computer literate		0.019	0.023		0.024	0.028
		(0.044)	(0.044)		(0.049)	(0.049)
Female	-0.330***	-0.328***	-0.330***	-0.364***	-0.363***	-0.366***
	(0.036)	(0.036)	(0.036)	(0.042)	(0.042)	(0.042)
Urban	0.087**	0.086*	0.085*	0.097*	0.096*	0.095*
	(0.044)	(0.045)	(0.045)	(0.050)	(0.051)	(0.051)
Age categories						
25-35	0.149***	0.147***	0.148***	0.180***	0.181***	0.182***
	(0.041)	(0.041)	(0.041)	(0.046)	(0.047)	(0.047)
35-50	0.320***	0.326***	0.328***	0.380***	0.390***	0.392***
	(0.048)	(0.049)	(0.049)	(0.056)	(0.058)	(0.058)
50-65	0.415***	0.406***	0.411***	0.476***	0.468***	0.474***
	(0.093)	(0.097)	(0.097)	(0.106)	(0.110)	(0.111)
Race						
African	-0.171	-0.132	-0.134	-0.232	-0.190	-0.193
	(0.244)	(0.247)	(0.247)	(0.280)	(0.285)	(0.286)
Coloured	-0.074	-0.035	-0.040	-0.122	-0.079	-0.085
	(0.248)	(0.251)	(0.251)	(0.284)	(0.290)	(0.290)
Asian/Indian	-0.208	-0.194	-0.184	-0.234	-0.220	-0.207
	(0.326)	(0.327)	(0.327)	(0.373)	(0.377)	(0.378)
Education						
Primary	-0.044	-0.037	-0.041	-0.052	-0.044	-0.049
	(0.058)	(0.060)	(0.060)	(0.066)	(0.068)	(0.068)
Secondary	0.147**	0.143**	0.140**	0.161**	0.158**	0.154*
	(0.067)	(0.070)	(0.070)	(0.076)	(0.080)	(0.080)
Tertiary	0.397***	0.381***	0.375***	0.440***	0.423***	0.417***
	(0.081)	(0.088)	(0.088)	(0.093)	(0.100)	(0.100)
Health						
Good-Very Good	0.109	0.106	0.105	0.115	0.111	0.110
	(0.070)	(0.071)	(0.071)	(0.078)	(0.079)	(0.079)
Excellent	0.149**	0.146**	0.146**	0.161**	0.157*	0.157*
	(0.073)	(0.074)	(0.074)	(0.080)	(0.082)	(0.082)

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

# Results

- The wave variable indicates increasing employment over time.
- Mobile phone and waves dummies move from negative and significant to insignificant over time.
- Suggesting a growing adoption of smartphones and internet usage.

Table 4: Estimation results of owning a mobile phone and becoming employed

Variables	Probit Model			Probit Model with Random Effects		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Wave 3	0.011 (0.052)	0.002 (0.053)	0.131 (0.087)	0.052 (0.057)	0.044 (0.059)	0.186* (0.097)
Wave 4	0.207*** (0.050)	0.201*** (0.050)	0.231** (0.100)	0.264*** (0.057)	0.257*** (0.057)	0.273*** (0.111)
Wave 5	0.183*** (0.050)	0.175*** (0.051)	0.226** (0.094)	0.255*** (0.059)	0.249*** (0.060)	0.294*** (0.105)
Mobile phone x Waves 3			-0.203* (0.109)			-0.222* (0.121)
Mobile phone x Waves 4			-0.058 (0.115)			-0.042 (0.128)
Mobile phone x Waves 5			-0.083 (0.111)			-0.075 (0.123)
Provinces	yes	yes	yes	yes	yes	yes
Constant	0.266 (0.265)	0.215 (0.268)	0.170 (0.271)	0.333 (0.303)	0.278 (0.308)	0.236 (0.312)
Insig2u				-1.498 (0.286)	-1.432 (0.278)	-1.426 (0.278)
$\sigma_u$				0.473 (0.068)	0.489 (0.068)	0.490 (0.068)
$\rho$				0.183 (0.043)	0.193 (0.043)	0.194 (0.043)
Observations	5,549	5,487	5,487	5,549	5,487	5,487
Log likelihood	-3670	-3626	-3625	-3660	-3616	-3614

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

# Results

- Owning a mobile phone and having a home computer decreases the probability of becoming unemployed.
- Living in an urban area, being older, having a tertiary or secondary education and being in good health are all contributing factors in decreasing the probability of losing one's job.
- Women are more likely than men to become unemployed.
- African and Coloured adults are more likely to become unemployed relative to Whites.

Table 5: Estimation results of owning a mobile phone and becoming unemployed (abridged)

Variables	Probit Model			Probit Model with Random Effects		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Mobile phone	-0.196*** (0.035)	-0.185*** (0.035)	-0.229*** (0.064)	-0.239*** (0.046)	-0.226*** (0.046)	-0.265*** (0.083)
Home computer		-0.160*** (0.044)	-0.161*** (0.044)		-0.198*** (0.058)	-0.199*** (0.058)
Computer literate		-0.055 (0.034)	-0.055 (0.034)		-0.072 (0.045)	-0.072 (0.045)
Female	0.181*** (0.027)	0.181*** (0.027)	0.181*** (0.027)	0.252*** (0.039)	0.252*** (0.039)	0.252*** (0.039)
Urban	-0.068** (0.032)	-0.060* (0.032)	-0.059* (0.032)	-0.108** (0.045)	-0.097** (0.046)	-0.096** (0.046)
Age categories						
25-35	-0.296*** (0.036)	-0.300*** (0.036)	-0.299*** (0.036)	-0.360*** (0.048)	-0.364*** (0.048)	-0.364*** (0.048)
35-50	-0.629*** (0.037)	-0.634*** (0.038)	-0.634*** (0.038)	-0.788*** (0.054)	-0.795*** (0.055)	-0.795*** (0.055)
50-65	-0.822*** (0.054)	-0.844*** (0.056)	-0.844*** (0.056)	-1.057*** (0.078)	-1.084*** (0.080)	-1.084*** (0.080)
Race						
African	0.533*** (0.113)	0.431*** (0.116)	0.429*** (0.116)	0.743*** (0.157)	0.612*** (0.159)	0.610*** (0.159)
Coloured	0.355*** (0.116)	0.273** (0.118)	0.270** (0.118)	0.508*** (0.160)	0.403** (0.162)	0.401** (0.162)
Asian/Indian	0.271 (0.175)	0.245 (0.175)	0.243 (0.175)	0.386 (0.242)	0.356 (0.242)	0.354 (0.242)
Education						
Primary	0.074* (0.041)	0.086** (0.043)	0.087** (0.043)	0.097* (0.059)	0.119** (0.060)	0.120** (0.060)
Secondary	-0.130*** (0.050)	-0.091* (0.053)	-0.089* (0.053)	-0.195*** (0.071)	-0.136* (0.074)	-0.134* (0.074)
Tertiary	-0.423*** (0.054)	-0.343*** (0.060)	-0.341*** (0.060)	-0.574*** (0.077)	-0.465*** (0.084)	-0.464*** (0.084)
Health						
Good-Very Good	-0.191*** (0.049)	-0.198*** (0.049)	-0.197*** (0.049)	-0.227*** (0.063)	-0.238*** (0.064)	-0.237*** (0.064)
Excellent	-0.158***	-0.163***	-0.162***	-0.181***	-0.190***	-0.189***

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

# Conclusion

- In developing countries where search costs are high mobile phones have the potential to reduce this inefficiency.
- These devices can also help with improving market efficiencies, access to financial services and overall reduction in poverty.
- This can be achieved through expanding network coverage, affordable prices of smartphones and mobile devices, and low prices of mobile data services.



Thank you

Q&A