

# Policy Brief

## **How Do Labor Markets Equilibrate? Using Mobile Phone Records to Estimate the Effect of Local Labor Demand Shocks on Internal Migration and Local Wages**

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### **Abstract**

A central question in the study of migration concerns the role that migrants play in bringing an economy towards a more efficient use of its resources. Yet, the lack of reliable data on migration has hampered our ability to observe how migration affects labor markets. We develop new methods for studying migration using terabytes of mobile phone data from Rwanda. We describe patterns of migration at a timescale and spatial resolution that is impossible with traditional data. These methods also allow us to provide new insight into the role of migration in labor markets in low income countries.

### **Narrative Report**

**M**igrants have long been thought to play a central role in helping an economy make efficient use of its resources. When a productivity shock raises the marginal product of workers in one location, migrants are the arbitrageurs who bring their economy back to equilibrium and restore an optimal allocation of their society's resources. This conjectured process of arbitrage – that it takes place, that it encourages equilibrium, and that it leads to an efficient allocation of resources – is one of the central tenets of Economics. Yet we have remarkably little empirical evidence on how this

arbitrage occurs, especially in the context of labor markets, and especially in low-income countries. Historically, such research has been constrained by the lack of reliable, micro-level data on internal migration.

One key result of this project was to develop methods for leveraging new sources of “big data” to measure patterns of internal migration in developing countries. Specifically, our work illustrates how the data collected by mobile phone operators can be used to reconstruct the physical trajectories of millions of individuals over a period of several years. In Rwanda, these algorithms made it possible to quantify migration at a spatial and temporal

resolution that has not been achieved in prior research or policy. Of course, the methods are not specific to Rwanda; they should be relevant to any low income country where a researcher or policymaker has access to anonymized mobile phone metadata.

A second contribution of this project is descriptive. We applied these algorithms to several terabytes of data covering 4 years of activity in Rwanda, and used them to provide detailed evidence on the nature of migration. As has been suggested in prior qualitative work, we observe that a majority of migrations occur between rural areas. By disaggregating the movement of the population to the level of the day and week – rather than the annual scale typical of household surveys – we also observe significant flows over smaller time scales. A large share of the “migrations” we observe last less than three months, which suggests additional nuance is required when policymakers determine who qualifies as a migrant.

Finally, our substantive results – while preliminary – provide insight into the role of migrants in labor markets in low income countries. The focus of this aspect of our research was to better understand how migrants respond to unanticipated shocks to labor demand, and how labor markets in turn respond to such migration. In this effort, we used spatially-disaggregated data on commodity prices, agricultural yield, and weather, to model

labor demand. Our analysis indicates that migrants are indeed responsive to labor demand shocks, with sensitivity peaking roughly 4 weeks before the window that policymakers have identified as the peak migration period. We see substantial migration responsiveness from both positive labor demand shocks in destination locations and from negative labor demand shocks at a migrant’s origin location. The majority of the migrants induced to move by these seasonal labor demand shocks do indeed return to their home location, as one might expect with the cyclical nature of seasonal migration, but we see many migrants visit at least one more location before returning home.



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