



# Migration and household adaptation to climate: A review of empirical research<sup>☆</sup>



H. Allen Klaiber

Department of Agricultural, Environmental and Development Economics, The Ohio State University, 2120 Fyffe Road, 333 Ag Admin Building, Columbus, OH 43210, USA

## ARTICLE INFO

### Article history:

Received 13 December 2012  
Received in revised form 27 December 2013  
Accepted 3 April 2014  
Available online 16 April 2014

### JEL classification:

Q54  
R20  
R14  
Q51

### Keywords:

Climate change  
Adaptation  
Migration  
Sorting  
Land use

## ABSTRACT

This paper reviews empirical research on migration and land use impacts associated with climate change. Household migration arises due to changes in economic opportunities and climate amenities resulting from climate change. Throughout the paper, efforts are made to highlight key empirical findings as well as areas in need of additional research. The existing literature is discussed through the lens of reduced form and structural approaches paying particular attention to preference heterogeneity and the often complex interconnections between economic sectors in determining household migration. Areas in need of additional research include improving our understanding of the coupling between human and natural systems, accounting for endogenous attributes and payoffs, and incorporating richer characterizations of the tradeoffs driving migration across multiple economic sectors.

© 2014 Elsevier B.V. All rights reserved.

## 1. Introduction

Migration provides a window into the non-marginal adjustments individuals are willing to make as they adapt to climate change. These changes may occur suddenly in response to severe weather and natural disasters or gradually over time as individuals update future expectations about climate and economic opportunities in response to changes in climate. Observing changes in location provides a measure of the implicit costs associated with climate change that induce households to re-locate.<sup>1</sup> Recovering willingness to pay from migration models informs us of the thresholds for these migration inducing costs and the incentives required to adapt. Looking at past actions, migration models tell us how people have previously responded, or not, to climate change and inform us about likely future responses to continued climate change. Predicting migration patterns resulting from climate change is central to sound policy making and a focus of an emerging body of empirical research.

In 2009 the world population living in urban areas exceeded the population in rural areas for the first time (United Nations, 2009). World population is expected to increase to over 9 billion by the year 2050 with urban areas absorbing the majority of the additional population. Understanding the linkages between climate change, land use change, and migration presents a number of questions and challenges for applied researchers. Among these is the need to better understand the drivers underlying household migration, assess how changes in population are likely to influence land use locally and at larger spatial scales, and predict how future changes in climate are likely to alter the relationship between individuals and land use as they adapt to changing conditions. Existing research suggests that climate change impacts may be substantial and impact a variety of economic sectors. These impacts include both trade and productivity in the agricultural sector (Deschenes and Greenstone, 2007; Schlenker et al., 2005), human health (Pattanayak and Pfaff, 2009; Patz and Olson, 2006), as well as land use and urbanization patterns (Marchiori et al., 2012).

Obtaining empirical estimates of climate change induced adaptation and economic impacts in areas where markets either do not exist or are not directly influenced by climate is difficult due to the public good (bad) nature of climate that precludes the existence of well-functioning markets. As a result, much of the empirical research on climate change migration has focused on the markets for housing, labor, and agriculture as those markets embody many of the impacts

<sup>☆</sup> I would like to thank without implicating participants at the 2012 NBER Integrated Assessment Modeling Conference, Kerry Smith, the editor and an anonymous referee for helpful comments and suggestions.

E-mail address: [klaiber.16@osu.edu](mailto:klaiber.16@osu.edu).

<sup>1</sup> Over very short periods of time, the extent of relocation may be dampened due to transactions costs associated with migration.

of climate change on individual well-being and are readily observable. The empirical challenge is to unbundle and identify the impacts of climate from the myriad of additional factors which are also captured by those markets.

To study climate change migration, researchers must explicitly or implicitly define starting and ending points in the migration process. These points may be temporal, in the sense that one examines changes in population at a single location over time, spatial in the context of following individuals over time and comparing their beginning and ending locations, or a combination of both. While researchers may focus their attention on the endpoint, beginning point, or both, defining these points and designing an identification strategy around those is a key feature of empirical migration research.<sup>2</sup> Defining the beginning and ending points of migration also raises important questions about the migration process. That is, does migration represent a form of disequilibrium? While the theoretical underpinnings of location choice described by the “vote with your feet” notions of *Tiebout (1956)* provide a mechanism that drives adjustment, modeling the adjustment process itself involves notions of equilibria. To evaluate migration, particularly structurally, requires a model where migration is the process of moving from one equilibrium point to another point within an equilibrium framework. Focusing only on end points often assumes an equilibrium has been reached, while focusing on beginning points assumes that one has not yet left an initial equilibrium.

This review examines issues associated with climate change migration through the lens of a number of empirical models. This body of research largely seeks to address two core hypotheses. First, to what extent do households migrate in response to changes in economic opportunities that arise due to the influences of climate change on important economic sectors in the economy. Examples of sectors disproportionately influenced by climate change include agriculture, due to the strong reliance on weather and precipitation, as well as labor markets resulting from changes in productivity and labor supply shifts as migration occurs. If households' economic opportunities are altered by these changes, they have an incentive to relocate.

The second empirical hypothesis focuses on the response of individuals to climate as a consumption amenity. In this context, household preferences are directly associated with climate and climate change alters the utility maximizing decisions of households, potentially resulting in relocation if changes in utility are large enough to offset the costs of migration. For example, *Blomquist (1988)* finds substantial evidence that climate is a key determinant of quality of life along with other factors such as environmental quality and urban conditions. For climate change researchers, an important insight from this research is the degree to which climate and other quality of life measures are correlated. *Blomquist* reports correlations in quality of life of nearly 0.5 between urban conditions such as crime and student teacher ratios and climate while that correlation drops to 0.21 when associated with environmental quality. This correlation suggests that the influence of climate is not easily separated and identified from other factors that are likely to influence decision making. Further, observed tradeoffs are likely to reflect heterogeneous preferences and underscore the finding that “the ranking for households who value only a subset of amenities can be quite different...”

Empirical research frequently begins by selecting an econometric specification that defines the spatial scale and distributional impacts of migration as a function of climate change. The heterogeneity introduced into econometric specifications takes on a variety of forms including the potential for differential impacts across subsets of populations, the influence of spatial scale on our ability to tease out heterogeneous responses, as well as differences in short versus long run response that may arise due to mobility constraints. To address

these issues, empirical researchers have relied on a variety of econometric methods ranging from reduced form estimates of key parameters to fully structural models of the location choice decision. Regardless of empirical perspective, the observed location patterns of individuals play a central role in identifying migration responses to climate change.

The remainder of this review is structured as follows. The next two sections present an overview of reduced form and structural approaches applied to climate change migration, respectively. The fourth section examines literature linking migration to changes in economic opportunities with an emphasis on changes in the agricultural and labor sectors driving migration. The fifth section reviews the literature on climate as a consumption amenity influencing household location choices directly. The sixth section describes efforts to incorporate both economic opportunity and amenity driven migration in a unified empirical framework. The final section discusses the lessons learned and challenges and opportunities that lie ahead.

## 2. Reduced form analyses of migration

Reduced form and structural models applied to climate change present a number of empirical tradeoffs to the empirical researcher. Reduced form models, often starting with an underlying theory of behavior and deriving a key statistic or result from that theory, are characterized by their careful and clear identification strategies which make them attractive for measuring key parameters. These methods have their origins in the early hedonic and wage-hedonic literature of *Rosen (1974)* and *Roback (1982)*. The Rosen-Roback model uses equilibrium outcomes resulting from an underlying structural process to describe how amenities, including climate, impact equilibrium wages and housing prices, without the need to directly model the underlying structural decision making process.<sup>3</sup>

The reduced form empirical literature can be grouped into categories reflecting the key sources of identification used in each study. These categories include historical time series, cross-sectional, and event based analyses. Empirical applications using historical time series data often implicitly assume the start of the study period is a close approximation for the beginning point of the migration process, either due to frictions which slow the migration responses or by using a time period prior to changes in climate that are expected to result in migration. Cross-sectional studies frequently model the endpoint of migration and focus on key economic distributions including wages and housing prices. Event based analyses define beginning points and ending points explicitly on either side of an event. Differences in the focal point of the migration process largely define what is measured in each study ranging from actual migration to indirect measures of outcomes including the effect of migration on other markets (housing and labor).

The increasing use of event studies in the recent literature reflects the appeal of quasi-random experiments which aid identification by controlling for unobservables using notions of random assignment drawn from the program evaluation literature. Quasi-experimental approaches rely on naturally occurring climatic events, such as a natural disaster, that allow identification of treatment and control groups. These events often occur over short time periods and/or involve severe weather such as hurricanes or tornados which may cause localized damages and flooding to which economic agents respond. The central identification assumption is that the locations and agents impacted by these events are randomly assigned. Using this random assignment, one common form of quasi-experimental design relies on a difference-in-difference estimation strategy to compare the outcomes experienced by the impacted group (treated) relative to the non-impacted group

<sup>2</sup> Dynamic models of migration could include discussion of flows and paths between these points.

<sup>3</sup> Modeling equilibrium outcomes as functions of expectations of future amenities and climate would capture some elements of the dynamic nature of migration resulting from climate change.

Download English Version:

<https://daneshyari.com/en/article/5064693>

Download Persian Version:

<https://daneshyari.com/article/5064693>

[Daneshyari.com](https://daneshyari.com)