"Babeș-Bolyai" University

Faculty of Economics and Business Admistration

Doctoral Thesis

Summary

Empirical Evidence of Economic and Climate Marginal Effects on Labour Migration

Supervisor:

Professor Habil. PhD. Monica Ioana POP SILAGHI

PhD. Candidate:

Ecaterina TOMOIAGĂ

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Cuprins

1. Summary of the Thesis

Studying migration over time has made us understand people's mobility and diversity. Typically, this type of research explains why people choose to migrate, under what conditions migration takes place, and what are the implications of migration for the individuals who decide to migrate and for the countries/regions of origin or destination.

The objective of this thesis is to explore two distinct aspects of migration: internal migration in Romania and international migration from Asia. The first objective of the thesis is to study the economic effects on internal migration. And the second objective is to examine the impact of climate change on international migration.

Migration is not a new phenomenon, but the study of migration at an interdisciplinary level is new. This is also the aim of part of this thesis: the study of human migration by combining two fields, namely economics and geography. More specifically, we will study the influence of climate change on labour migration.

The main research questions are the following:

1. Is internal migration in Romania explained by the Harris-Todaro model and its extensions?

2. Does climate change influence international migration from Asia?

In this research we will start by presenting the theoretical aspects of migration from both perspectives: internal migration and international migration. Then, we move on to the empirical part, which contains two main studies. The first study consists in studying the internal migration of Romanians starting from the basic Harris-Todaro model and we also use an extension of this model. Using an updated database (for the time period 2002-2021) push and pull factors influencing migration are identified. In this way we contribute to the literature by providing new insights based on recent data. At the same time, we also contribute by using rural and urban areas in Romania rather than regions.

The second empirical study covers international migration. The main hypothesis tested is whether climate change can be a reason for people to migrate to another country. We undertook a panel data analysis for Asian countries. We chose this region because it is among the regions most affected by climate change. We also conducted a comparative analysis for two Asian countries that are most affected by climate change: China and India. In both cases, we used an extended version of the gravity model. This is also a contribution to the literature in that we include new variables in the model: political stability, common language, religious proximity, the same colonizer, and dummy for crisis (year 2009 financial crisis and year 2020 pandemic year).

Migration can be divided into two main categories: internal migration and international migration. Internal migration is the decision of people to move within the same country.

Thus, we can distinguish several forms of population movement, namely: migration from rural to urban (or vice versa), and from rural to other rural areas, or from urban areas to other urban areas. While international migration is the process of movement from a country of origin to another country, which is the country of destination.

Migration is a complex process, regardless of the type of migration, which is determined by many factors, such as economic, social, political, or climatic factors. Therefore, from a theoretical point of view, several theories of this phenomenon have been developed. A first theory would be the spatial theory, which argues that the decision to migrate is influenced by the distance between countries of origin and destination, and the size of the countries of origin and destination. This theory is also known as the gravity model.

The second theory is the economic theory, whereby migration is mainly explained by economic factors. So, people migrate because of wage differentials, or low unemployment rates. In general, people move to destinations that offer better economic conditions.

Another theory is the behavioural theory, in which psychological factors take precedence. Specifically, it explores how cognitive processes and decision-making play a mediating role between the socio-economic environment and individual migration decisions. The last theory identified was social theory. It starts from the premise that the decision to migrate is influenced by family and/or friends (Rajan and Bhagat, 2022).

Based on these theories, we can particularise aspects of internal and international migration. In every country there is internal migration and there are push or pull factors that determine it. Push factors (food shortages, war, natural disasters) are those that influence people to leave their place of origin. Pull factors influence people to move to other regions for better jobs or better weather conditions.

The main reasons people migrate internationally are to find a better job, reunite with other family members, or for a better education. At the same time, some people are forced to migrate. Especially because of conflict, persecution, or natural disasters.

According to data from 2020 (United Nations) countries in Europe are hosting the highest number of immigrants. The second largest are countries in Asia, followed by North America, Africa, Latin America and the Caribbean, and Oceania.

Particular importance should be attached to migration according to the origin of the migrant. We will therefore also present some aspects of global migration. We will start with America. Once America was discovered, people from all over the world were attracted to this destination. For example, in the United States in the mid-19th century there were immigrants from the Northern part of Europe, and in the early 20th century there were immigrants from the Southern and Eastern parts of Europe. The period after 1965 saw flows of immigrants from Latin America, Asia, and Africa. Although the United States attracts immigrants from all continents, most immigrants come from neighboring Mexico. After the United States, Canada is the next most popular destination for immigrants.

Europe has seen many changes over the years, from the fall of the Berlin Wall in 1989, the disintegration of the Soviet Union in 1991, the fall of communism in Central and Eastern Europe, to the creation of the European Union. These changes have significantly influenced the migration of people. For example, Southern Europe became a destination for migrants between 1989 and 2008, after more than a century of being a major source of migrants to Western Europe, North and South America, and Australia.

Since the 1990s, migration from Asia has started to increase very rapidly. Levels of urbanisation in Asia are higher than in Europe or North America. Asia has played an important role in global long-distance migration since the 1960s. Today, Asians migrate both domestically and internationally. There are approximately 1.3 million recorded migrants leaving Asia (Gold and Nawyn, 2019).

In terms of migration from Africa, the number of migrants living abroad has doubled since the 1990s. Most migrants went to Europe, Asia and North America.

However, migration is not always permanent, many people who have migrated return to their region of origin. This is where the phenomenon of return migration comes in. The return migration can be permanent or temporary.

It should be noted that migration can also be affected by other factors, such as crises. A recent example is the COVID pandemic. Thus, globally in 2020 there has been a decrease in international migration and an increase in return migration. Due to travel restrictions and job losses many migrants have been forced to return to their country of origin.

In the following, we make the transition from the theoretical part to the first empirical part of the thesis. In chapter three, we turn our attention to studying internal migration in Romania using the Harris-Todaro model and an extended version of this model.

The most common form of migration globally is internal migration. For example, in 2010, 740 million people migrated internally. While in the same year only 214 million people migrated internationally.

Every country in the world has experienced or is experiencing internal population movement. While there are many forms of internal migration, people migrate mostly from rural to urban areas. Therefore, we will study this form of migration in the case of Romania.

At a theoretical level, migration from rural to urban areas is found in the form of a well-known model, the Harris-Todaro model. The basic model explains rural-to-urban migration by the fact that the expected wage in urban areas is higher than the wage received in rural areas. At the same time, high unemployment in the region of origin also drives people to migrate.

Thus, internal migration can be explained by push and pull factors. By push factors we mean low conditions in the region of origin, such as low wages or high unemployment rates. Pull

factors refer to better conditions in the destination region: high wages, low unemployment rates.

Countries around the world were considered for the study of rural-urban migration. In the following we present a selection of studies in which the Harris-Todaro model and extensions of this model have been validated. The Harris-Todaro model has been validated for North-South areas in Canada (Petrov, 2007), Albania (Hagen-Zanker and Azzari, 2010), Senegal (Goldsmith et al., 2004), Ethiopia (Eshetu and Beshir, 2017), North-West Pakistan (Ikramullah&Rehman, 2011), Philippines (Sanders &Brown, 2012). Extensions of the Harris-Todaro model have been validated for Brazil (Busso et al, 2021), Chile (Villalobos&Riquelme, 2023), Poland (Ghatak et al, 2008).

There is also a study in the case of Romania, specifically Pop Silaghi & Ghatak (2011) studied migration at the interregional level. The time interval analysed was 1995-2005 and the application of cross-section Seemingly Unrelated Regressions showed that Romanians move from rural to urban areas due to wage differentials. Unexpected results were obtained before taking into account periods of economic restructuring. These results were also due to the fact that Romania had recently changed political regime. At that time, people lost their jobs and were migrating from urban to rural areas to reduce their living costs. We differ from this study in that we use rural and urban areas rather than regions to study migration. Moreover, we also use an updated database (for the period 2002-2021) which leads to different results.

In order to answer the first research question, we constructed a panel database for the 41 counties of Romania. The data were collected for the time period 2002-2021 and are provided by the National Institute of Statistics and Economic Studies of Romania. The dependent variable is the number of emigrants from rural areas. As independent variables, we included rural and urban incomes and rural and urban unemployment rates.

For the empirical part we used Period Seemingly Unrelated Regressions and obtained validation of the basic Harris-Todaro model. Romanians migrate from rural to urban because of higher wages in cities and low unemployment rates in urban areas. For robustness we included the dummy variable for crisis. The model remains robust in terms of the results obtained in the first place, economic effects are significant in the decision to migrate.

We also tested an extension of the Harris-Todaro model including in addition to income and unemployment rates in rural and urban areas, the number of houses and hospitals per 1000 inhabitants, and the length of roads in urban areas. For income and unemployment rates the results are the same as in the basic model. Specifically, we obtained a negative and significant coefficient for income in the origin and a positive and significant coefficient for the unemployment rate in the origin. For destination income we obtained a positive and significant sign and for destination unemployment rate a negative and significant coefficient. And for the new variables included we obtained positive and significant signs, which means that for Romanians living conditions in the destination are important, in addition to economic

aspects. As for robustness we included the dummy variable for crisis and obtained robust results.

So, internal migration in Romania is driven by push (low income and high unemployment rates in rural areas) and pull (high wages and low unemployment rates in urban areas) factors. At the same time, better living conditions in urban areas attract migrants from rural areas.

To reduce the number of migrants from rural areas, more jobs should be created in rural areas by providing financial support to the agriculture and tourism sectors. At the same time, more investment should be made in infrastructure in rural areas to attract more people to live there.

In future research, it would be important to include demographic factors (age, marital status, and family size) in the study of migration. These factors are important because they can better determine the characteristics of a person who migrates and thus better understand the factors behind the decision to migrate.

Although we have identified that people mostly resort to internal migration, another way in which people move may be internationally. Therefore, we also considered it important to study this type of migration. Thus, chapter four consisted of conducting another empirical study, in which climate-driven international migration from Asia was addressed.

For the variable of interest, climate change, we will use temperature changes as a proxy in the first phase. According to United Nations (2023) in Asia in 2022, the second or third highest average temperature was recorded, which was 0.71 degrees Celsius above the average recorded over the time period 1991-2020. We will also use another proxy for climate change: the number of natural disasters. United Nations (2023) claims that Asia is the most disaster-prone region. In addition, we have included the level of CO_2 emissions as another proxy for climate change. According to Our World in Data (2017), Asia is the largest emitter, accounting for 53% of global emissions.

It is necessary to make a review of the literature. Studies have been carried out using various proxies for climate change. For example, natural disasters have been used by Beine & Parsons (2015), Gröschl & Steinwachs (2017), Mbaye (2017). Temperature levels were used by Backhaus et al (2015), Cai et al (2016). Droughts were used as a proxy by Gray & Mueller (2012a), Hermans & Garbe (2019), Debnath & Nayak (2022). The results of these studies indicate that people are migrating due to climate change.

We will therefore look at climate change-induced migration for 44 countries of origin in Asia. As destinations we have considered 29 OECD (Organisation for Economic Co-operation and Development) countries according to data availability. We constructed an unbalanced panel database for the period 2000-2020. Using an extended version of the gravity model we included as a dependent variable the number of migrants from the country of origin to each destination country. For the independent variables we included: population in origin and destination, transport costs for which we used as proxy the distance between origin and destination countries, political stability, climate change, GDP per capita, unemployment rate

in origin and destination countries. We also included some dummy variables: common official language, common ethno-language (if at least 9% of the population speak a common language), religious proximity, sibling (if the countries have the same settler). All data were extracted from World Bank, Em-Dat, IMF, and CEPII.

We will estimate the gravity equation by applying the Poisson Pseudo Maximum Likelihood (PPML) estimator with fixed effects. This estimator is suitable because it solves the presence of null values for the dependent variable and the multicollinearity problem that is encountered in gravity models (Alvarez et al, 2018).

The results indicate that climate change is affecting migration for Asians. This impact is observed through various proxies for climate change: changes in temperature, natural disasters, or CO_2 emissions. The results indicate that changes in temperature and the level of CO_2 emissions in origin and destination countries influence the decision to migrate. In addition, in the case of natural disasters we obtained that they are significant only in the destination. What this means is that Asians are stuck in their home country when a natural disaster occurs and they cannot leave immediately, but when they can afford to leave they choose a destination that is not so disaster prone.

Moreover, we can also identify push and pull factors in international migration. Push factors are lower GDP per capita in origin, high unemployment in origin, political instability in origin, climate change in origin, and crises. Push factors are population in destination, high GDP per capita in destination, low unemployment rate in destination, political stability in destination, climate change in destination, common language, religious proximity, and common settler.

These results encouraged us to study the influence of climate change on migration in the largest migrant-generating countries: China and India. At the same time, these countries also face problems caused by climate change. According to the World Population Review (2020) China has the highest CO_2 emissions, ranking first globally, and India ranks third. At the same time, according to EM-DAT (2018) India is the country with the most recorded natural disasters in the world, and China ranks third.

Thus, we constructed a panel database for the time interval 1995-2018. As in the previous empirical study we use the gravity model and include approximately the same variables. Specifically, we will change the dummy variable, we will only include the common language spoken by at least 4% of the population. The results obtained from applying the PPML fixed effects estimator indicate that the decision to migrate due to climate change is more common for Chinese than for Indians. Specifically, it is driven by the level of CO_2 emissions, natural disasters and temperature changes for Chinese migration to OECD countries. In the case of India, we obtained unexpected results. One reason could be that Indians do not take climate change into account due to the fact that the majority of the population cannot afford to migrate because of liquidity constraints.

So, action should be taken to help people adapt locally to climate change. For example, more green spaces should be created to cope with gradual changes (temperature change) or carbon emissions should be reduced through the use of renewable energy sources. In the case of immediate climate events, more investment should be made in infrastructure to cope with floods or the use of drought-resistant plants.

Whether we are talking about internal or international migration, these can be explained by push and pull factors. Specifically, poor conditions in areas of origin lead people to move to other areas and better conditions in destination regions lead people to come and live in those regions.

References

G. J. Abel, M. Brottrager, J. C. Cuaresma, and R. Muttarak. Climate, conflict and forced migration. Global environmental change, 54:239‑249, 2019.

M. Abrahamson. Migration Between Nations: A Global Introduction. London, Routledge, pp. 70-87, 2022.

C. Ackah and D. Medvedev. Internal migration in Ghana: Determinants and welfare impacts. International Journal of Social Economics, 39(10):764‑784, 2012.

A. Aldashev and B. Dietz. Economic and spatial determinants of interregional migration in Kazakhstan. Economic Systems, 38(3):379‑396, 2014.

I. C. Alvarez, J. Barbero, A. Rodriguez-Pose, and J. L. Zofio. Does institutional quality matter for trade? Institutional conditions in a sectoral trade framework. World Development, 103:72‑87, 2018.

R. Anghel, A. Botezat, A. Cos, ciug, I. Manafi, and M. Roman. International migration, return migration, and their effects: a comprehensive review on the Romanian case. 2016.

P. Anglewicz and T. W. Myroniuk. Shocks and migration in Malawi. Demographic Research, 38:321‑334, 2018.

A. Arnall and U. Kothari. Challenging climate change and migration discourse: Different understandings of timescale and temporality in the Maldives. Global Environmental Change, 31:199‑206, 2015.

G. Arnold. Migration: Changing the world. London: Pluto, pp. 21-50, 2012.

S. Ayeb-Karlsson and N. Uy. Island Stories: Mapping the (im) mobility trends of slow onset environmental processes in three island groups of the Philippines. Humanities and Social Sciences Communications, 9(1):1‑18, 2022.

A. Backhaus, I. Martinez-Zarzoso, and C. Muris. Do climate variations explain bilateral migration? A gravity model analysis. IZA Journal of Migration, 4(1): 1‑15, 2015.

J. Baez, G. Caruso, V. Mueller, and C. Niu. Heat exposure and youth migration in Central America and the Caribbean. American Economic Review, 107(5): 446‑450, 2017.

R. Bailey. Immigration and migration. Infobase Publishing, pp. 4-21, 2010.

N. Bairoliya and R. Miller. Social insurance, demographics, and rural-urban migration in China. Regional Science and Urban Economics, 91:103615, 2021.

B. H. Baltagi. A companion to theoretical econometrics, volume 1. Wiley Online Library, pp. 332-347, 2001.

S. Banerjee, J.-Y. Gerlitz, and D. Kniveton. A methodology for assessing patterns of labour migration in mountain communities exposed to water hazards. In Disentangling migration and climate change, pages 81‑100. Springer, 2013.

M. Barassi, M. Ercolani, M. Herrerias, and Z. Jin. Climate anomalies and migration between Chinese provinces: 1987‑2015. The Energy Journal, 39 (Special Issue 1), 2018.

A. Baronchelli and R. Ricciuti. Temperature shocks, rice production, and migration in Vietnamese households. Ecological Economics, 193:107301, 2022.

S. Barrios, L. Bertinelli, and E. Strobl. Climatic change and rural‑urban migration: The case of sub-Saharan Africa. Journal of Urban Economics, 60 (3):357‑371, 2006.

M. Beine and C. Parsons. Climatic factors as determinants of international migration. The Scandinavian Journal of Economics, 117(2):723‑767, 2015.

M. Beine, S. Bertoli, and J. Fernandez-Huertas Moraga. A practitioners' guide to gravity models of international migration. TheWorld Economy, 39(4):496‑512, 2016.

M. Berlemann and M. F. Steinhardt. Climate change, natural disasters, and migration—a survey of the empirical evidence. CESifo Economic Studies, 63 (4):353‑385, 2017.

P. C. Bhattacharya. Rural-to-urban migration in LDCS: A Test of two rival models. Journal of International Development, 14:951‑972, 2002.

B. Biagi, A. Faggian, and P. McCann. Long and short distance migration in Italy: the role of economic, social and environmental characteristics. Spatial Economic Analysis, 6(1):111‑131, 2011.

R. Black, D. Kniveton, and K. Schmidt-Verkerk. Migration and climate change: towards an integrated assessment of sensitivity. Environment and Planning A, 43(2):431‑450, 2011.

P. Bohra-Mishra, M. Oppenheimer, R. Cai, S. Feng, and R. Licker. Climate variability and migration in the Philippines. Population and environment, 38 (3):286‑308, 2017.

M. Bonasia and O. Napolitano. Determinants of interregional migration flows: the role of environmental factors in the Italian case. The Manchester School, 80 (4):525‑544, 2012.

M. Borderon, P. Sakdapolrak, R. Muttarak, E. Kebede, R. Pagogna, and E. Sporer. Migration influenced by environmental change in Africa. Demographic Research, 41:491‑544, 2019.

L. Boros and G. Nagy. The long-term socioeconomic consequences of the Tisza flood of 2001 in Szabolcs-Szatmar-Bereg County, Hungary. Belvedere Meridionale, 26(4):122‑130, 2014.

B. Bridges and N. Walls. Migration, displacement and education. United Nation: UNESCO Publishing, 2018.

O. Brown. Migration and climate change. United Nations, pp.16, 2008.

D. Bunea. Cross-country internal migration and convergence in Romania. Annales Universitatis Apulensis Series Oeconomica, 13(2):508‑521, 2011.

D. Bunea et al. Modern gravity models of internal migration. The case of Romania. Theoretical and Applied Economics, 4(4):127, 2012.

M. Busso, J. P. Chauvin, and N. Herrera. Rural-urban migration at high urbanization levels. Regional Science and Urban Economics, 91:103658, 2021.

R. Cai, S. Feng, M. Oppenheimer, and M. Pytlikova. Climate variability and international migration: The importance of the agricultural linkage. Journal of Environmental Economics and Management, 79:135‑151, 2016.

M. Call and C. Gray. Climate anomalies, land degradation, and rural out-migration in Uganda. Population and Environment, 41:507‑528, 2020.

C. Cattaneo and G. Peri. The migration response to increasing temperatures. Journal of development economics, 122:127‑146, 2016.

C.-C. Chao, J.-P. Laffargue, X. Liu, P. M. Sgro, and Y. Xiao. Migration and the environment: Policy reform in a polluted open economy. The World Economy, 38(1):48‑62, 2015.

J. Chen and V. Mueller. Coastal climate change, soil salinity and human migration in Bangladesh. Nature climate change, 8(11):981‑985, 2018.

N. D. Coniglio and G. Pesce. Climate variability and international migration: an empirical analysis. Environment and Development Economics, 20(4):434‑468, 2015.

N. R. Council. Global Report on Internal Displacement 2023 – Internal displacement and food security. Internal Displacement Monitoring Centre (IDMC), 2023.

Z. Cseres-Gergely. County to county migration and labour market conditions in Hungary between 1994 and 2002. Technical report, Budapest Working Papers on the Labour Market, 2005.

I. Dallmann and K. Millock. Climate variability and inter-state migration in India. CESifo Economic Studies, 63(4):560‑594, 2017.

S. Dasgupta, D. Wheeler, S. Bandyopadhyay, S. Ghosh, and U. Roy. Coastal dilemma: climate change, public assistance and population displacement. World Development, 150:105707, 2022.

H. De Haas, S. Castles, and M. J. Miller. The age of migration: International population movements in the modern world. Bloomsbury Publishing, pp. 117-224, 2019.

J. B. de Souza Ferreira Filho and G. I. De Moraes. Climate change, agriculture and economic effects on different regions of Brazil. Environment and Development Economics, 20(1):37, 2015.

M. Debnath and D. K. Nayak. Assessing drought-induced temporary migration as an adaptation strategy: Evidence from rural India. Migration and Development, 11(3):521‑542, 2022.

C. Dowlah. Cross-Border Labor Mobility: Historical and Contemporary Perspectives. Palgrave Macmillan Cham, pp. 300, 2020.

F. Eshetu and M. Beshir. Dynamics and determinants of rural-urban migration in Southern Ethiopia. Journal of Development and Agricultural Economics, 9(12):328‑340, 2017.

A. Fielding. The impacts of environmental change on UK internal migration. Global Environmental Change, 21:S121‑S130, 2011.

J. Garai, H. B. Ku, and Y. Zhan. Climate change and cultural responses of indigenous people: A case from Bangladesh. Current Research in Environmental Sustainability, 4:100130, 2022.

P. Gentle, R. Thwaites, D. Race, K. Alexander, and T. Maraseni. Household and community responses to impacts of climate change in the rural hills of Nepal. Climatic Change, 147(1-2):267‑282, 2018.

S. Ghatak, A. Mulhern, and J. Watson. Inter-Regional Migration in Transition Economies: The Case of Poland. Review of Development Economics, 12(1): 209‑222, 2008.

R. Glaser, I. Himmelsbach, and A. Bosmeier. Climate of migration? How climate triggered migration from southwest Germany to North America during the 19th century. Climate of the Past, 13(11):1573‑1592, 2017.

S. J. Gold and S. J. Nawyn. Routledge international handbook of migration studies. Routledge, pp. 64, 2019.

P. D. Goldsmith, K. Gunjal, and B. Ndarishikanye. Rural-urban migration and agricultural productivity: the case of Senegal. Agricultural Economics, 31:33‑45, 2004.

K. Grace, V. Hertrich, D. Singare, and G. Husak. Examining rural Sahelian outmigration in the context of climate change: An analysis of the linkages between rainfall and out-migration in two Malian villages from 1981 to 2009. World Development, 109:187‑196, 2018.

C. Gray and V. Mueller. Drought and population mobility in rural Ethiopia. World Development, 40(1):134‑145, 2012a.

C. Gray and E. Wise. Country-specific effects of climate variability on human migration. Climatic change, 135(3):555‑568, 2016.

C. Gray, D. Hopping, and V. Mueller. The changing climate-migration relationship in China, 1989‑2011. Climatic change, 160:103‑122, 2020.

C. L. Gray. Environment, land, and rural out-migration in the southern Ecuadorian Andes. World Development, 37(2):457‑468, 2009.

C. L. Gray and V. Mueller. Natural disasters and population mobility in Bangladesh. Proceedings of the National Academy of Sciences, 109(16):6000‑6005, 2012b.

P. Gregoriou, Z. Kontolemis, M. Matsi, et al. Immigration in Cyprus: An analysis of the determinants. Cyprus Economic Policy Review, 4(1):63‑88, 2010.

T. Gries, M. Kraft, and M. Simon. Explaining inter-provincial migration in China. Papers in Regional Science, 95(4):709‑731, 2016.

A. Groger and Y. Zylberberg. Internal labor migration as a shock coping strategy: Evidence from a typhoon. American Economic Journal: Applied Economics, 8(2):123‑153, 2016.

J. Groschl and T. Steinwachs. Do natural hazards cause international migration? CESifo Economic Studies, 63(4):445‑480, 2017.

J. Hagen-Zanker and C. Azzarri. Are internal migrants in Albania leaving for the better? Eastern European Economics, 48(6):57‑84, 2010.

R. Hanna and P. Oliva. The effect of pollution on labor supply: Evidence from a natural experiment in Mexico City. Journal of Public Economics, 122:68‑79, 2015.

S. Harper. Population‑environment interactions: European migration, population composition and climate change. Environmental and Resource Economics, 55(4):525‑541, 2013.

J. R. Harris and M. P. Todaro. Migration, Unemployment and Developmnent: A Two-Sector Analysis. The American Economic Review, 60:126, 1970.

K. Hermans and L. Garbe. Droughts, livelihoods, and human migration in northern Ethiopia. Regional Environmental Change, 19:1101‑1111, 2019.

V. Hnatkovska and A. Lahiri. Rural and urban migrants in India: 1983‑2008. The World Bank Economic Review, 29(suppl_1):S257‑S270, 2015.

N. Hunter. Immigration. Heinemann-Raintree Library, pp. 6-13, 2011.

G. S. Ikramullah and N. U. Rehman. Economic and social dimensions of rural urban migration in Pakistan: Results from a recent survey in the North West Pakistan. International Journal of Business and Social Science, 2(3), 2011.

D. Ionesco, D. Mokhnacheva, and F. Gemenne. The atlas of environmental migration. Taylor & Francis, pp. 34-53, 2016.

K. Iqbal and P. K. Roy. Climate change, agriculture and migration: Evidence from Bangladesh. Climate Change Economics, 6(02):1550006, 2015.

A. Ishtiaque and M. S. Ullah. The influence of factors of migration on the migration status of rural-urban migrants in Dhaka, Bangladesh. Human Geographies, 7(2):45, 2013.

I. Issah, T. Y. Khan, and K. Sasaki. Do migrants react to infrastructure difference between urban and rural areas? Development of an extended Harris‑Todaro model. In Review of Urban & Regional Development Studies: Journal of the Applied Regional Science Conference, volume 17, pages 68‑88. Wiley Online, 2005.

H. Istvan et al. Internal migration transition in Romania? Regional Statistics, 6(01):42‑53, 2016.

K. Jessoe, D. T. Manning, and J. E. Taylor. Climate change and labour allocation in rural Mexico: Evidence from annual fluctuations in weather. The Economic Journal, 128(608):230‑261, 2018.

C. K. Jha, V. Gupta, U. Chattopadhyay, and B. A. Sreeraman. Migration as adaptation strategy to cope with climate change: A study of farmers' migration in rural India. International Journal of Climate Change Strategies and Management, 2017.

S. Karanja Ng'ang'a, E. H. Bulte, K. E. Giller, J. M. McIntire, and M. C. Rufino. Migration and self-protection against climate change: a case study of Samburu County, Kenya. World Development, 84:55‑68, 2016.

M. Khamis and X. Li. Environment matters: new evidence from Mexican migration. Applied Economics Letters, 27(3):168‑173, 2020.

A. R. Khavarian-Garmsir, A. Pourahmad, H. Hataminejad, and R. Farhoodi. Climate change and environmental degradation and the drivers of migration in the context of shrinking cities: A case study of Khuzestan province, Iran. Sustainable Cities and Society, 47:101480, 2019.

R. King and K. Kuschminder. Handbook of return migration. Edward Elgar Publishing, pp. 24-25, 2022.

J. Klocker and F. Daumann. What drives migration to Germany? A panel data analysis. Research in Economics, 77(2):251‑264, 2023.

K. Kondo and T. Okubo. Interregional labour migration and real wage disparities: Evidence from Japan. Papers in Regional Science, 94(1):67‑87, 2015.

K. Kondoh. The economics of international migration. Springer, pp. 31-40, 2017.

K. Koser. International migration: A very short introduction. Oxford University Press, pp. 16-17, 2007.

V. Koubi, G. Spilker, L. Schaffer, and T. Bernauer. Environmental stressors and migration: Evidence from Vietnam. World Development, 79:197‑210, 2016.

S. Kumari. Rural-urban migration in India: determinants and factors. International Journal of Humanities and Social Sciences, 3(2):161‑180, 2014.

O. Kwon, J. Yoon, and Y. V. Yotov. A Generalized Poisson-Pseudo Maximum Likelihood Estimator. CESifo Working Paper, (10145):1‑42, 2022.

F. Laczko, C. Aghazarm, et al. Migration, Environment and Climate Change: assessing the evidence. Springer, 2009.

E. S. Lee. A theory of migration. Demography, 3:47‑57, 1966.

W. A. Lewis. Economic development with unlimited supplies of labour. The Manchester School, 22(2):115‑227, 1954.

A. Y. Liu and D. A. Dang. Rural‑urban migration in Vietnam: Trend and institutions. Springer, pp. 68-70, 2019.

Y. Liu and J. Shen. Spatial patterns and determinants of skilled internal migration in China, 2000‑2005. Papers in Regional Science, 93(4):749‑771, 2014.

Z. Liu and L. Yu. Stay or Leave? The Role of Air Pollution in Urban Migration Choices. Ecological Economics, 177:106780, 2020.

T. A. Luong, M.-H. Nguyen, N. K. Truong, and K. Le. Rainfall variability and internal migration: the importance of agriculture linkage and gender inequality. Economic Analysis and Policy, 77:326‑336, 2023.

S. Ma, X. Li, D. Li, and H. Guo. Does air pollution induce international migration? New evidence from Chinese residents. Economic Modelling, 120: 106176, 2023.

J. Marta, A. Fauzi, B. Juanda, and E. Rustiadi. Understanding migration motives and its impact on household welfare: evidence from rural-urban migration in Indonesia. Regional Studies, Regional Science, 7(1):118‑132, 2020.

M. Martin, M. Billah, T. Siddiqui, C. Abrar, R. Black, and D. Kniveton. Climate related migration in rural Bangladesh: a behavioural model. Population and environment, 36:85‑110, 2014.

M. Mastrorillo, R. Licker, P. Bohra-Mishra, G. Fagiolo, L. D. Estes, and M. Oppenheimer. The influence of climate variability on internal migration flows in South Africa. Global Environmental Change, 39:155‑169, 2016.

D. M. S. Matias. Climate humanitarian visa: international migration opportunities as post-disaster humanitarian intervention. Climatic Change, pages 1‑14, 2020.

M. Maurel and M. Tuccio. Climate instability, urbanisation and international migration. The Journal of Development Studies, 52(5):735‑752, 2016.

L. M. Mbaye. Climate change, natural disasters, and migration. IZA World of Labor, 2017.

M. McAuliffe and A. Triandafyllidou. World Migration Report 2022, 2022.

Š. Mikula and M. Pytlikova. Air Pollution and Migration: Exploiting a Natural Experiment from the Czech Republic. CERGE-EI Working Paper Series, (714), 2021.

V. Mueller, C. Gray, and D. Hopping. Climate-Induced migration and unemployment in middle-income Africa. Global Environmental Change, 65: 102183, 2020a.

V. Mueller, G. Sheriff, X. Dou, and C. Gray. Temporary migration and climate variation in eastern Africa. World Development, 126:104704, 2020b.

A. Mulhern and J. Watson. Spanish inter-regional migration: an enigma resolved. Applied economics letters, 17(14):1355‑1359, 2010.

R. J. Nawrotzki and M. Bakhtsiyarava. International climate migration: Evidence for the climate inhibitor mechanism and the agricultural pathway. Population, space and place, 23(4):e2033, 2017.

A. Naz and F. N. Khan. Rural-Urban Migration in South Asia: A Case Study of Pakistan. South Asian Studies, 36(1), 2022.

L. D. Nguyen, K. Raabe, and U. Grote. Rural‑urban migration, household vulnerability, and welfare in Vietnam. World Development, 71:79‑93, 2015.

L. D. Nguyen, U. Grote, and R. Sharma. Staying in the cities or returning home? An analysis of the rural-urban migration behavior in Vietnam. IZA Journal of Development and Migration, 7(1):1‑18, 2017.

T. P. L. Nguyen and C. Sean. Do climate uncertainties trigger farmers' outmigration in the Lower Mekong Region? Current Research in Environmental Sustainability, 3:100087, 2021.

C. Ocello, A. Petrucci, M. R. Testa, and D. Vignoli. Environmental aspects of internal migration in Tanzania. Population and Environment, 37:99‑108, 2015.

OECD. International Migration Outlook 2008. 2008.

C. Oyvat and M. wa G̃ıth̃ınji. Migration in Kenya: beyond Harris-Todaro. International Review of Applied Economics, 34(1):4‑35, 2020.

M. C. Pajaron and G. N. A. Vasquez. Weathering the storm: weather shocks and international labor migration from the Philippines. Journal of Population Economics, 33(4):1419‑1461, 2020.

A. N. Petrov. Revising the Harris-Todaro framework to model labour migration from the Canadian northern frontier. Journal of Population Research, 24:185‑206, 2007.

R. Pirvu, F. A. Murtaza, and O. Toma. Socio-Demographic and Regional Analysis of Internal Mobility in Romania Between 1990-2020. Journal of Political Science, (73):21‑31, 2022.

M. I. Pop Silaghi and S. Ghatak. Why do not they move from rural to urban areas? Inter-regional migration in Romania. Romanian Journal of Economic Forecasting, (1):143‑158, 2011.

H. M. Posada and A. I. Moreno-Monroy. Informality, city structure and rural‑urban migration in Latin America. The Annals of Regional Science, 59(2):345‑369, 2017.

C. Radel, B. Schmook, L. Carte, and S. Mardero. Toward a political ecology of migration: Land, labor migration, and climate change in northwestern Nicaragua. World Development, 108:263‑273, 2018.

S. I. Rajan and R. B. Bhagat. Climate change, vulnerability and migration. Taylor & Francis, pp.2, 2017.

S. I. Rajan and R. B. Bhagat. Researching Internal Migration. Taylor & Francis, pp.20-35, 2022.

R. Ramos. Gravity models: a tool for migration analysis. IZA World of Labor, 2016.

D. Ratha, S. De, E. J. Kim, S. Plaza, G. Seshan, and N. D. Yameogo. Phase II: COVID-19 crisis through a migration lens. Migration and development brief, 33, 2020.

M. Rauscher. Demographic change and climate change. Environment and Development Economics, 25(1):5‑20, 2020.

E. G. Ravenstein. The laws of migration. Royal Statistical Society, 1885.

J. Raymer and F. Willekens. International migration in Europe: Data, models and estimates. John Wiley & Sons, pp.4-5, 2008.

F. Riosmena, R. Nawrotzki, and L. Hunter. Climate migration at the height and end of the Great Mexican Emigration Era. Population and development review, 44(3):455, 2018.

J. Ruist. Causes and consequences of global migration. Anthem press, pp. 43-67, 2021.

C. Sancar and Y. E. Akba，s. The Effect of Unemployment and Urbanization on Migration in Turkey: An Evaluation in terms of the Harris-Todaro Model. Sosyoekonomi, 30(51):215‑239, 2022.

S. R. Sanders and D. L. Brown. The migratory response of labor to special economic zones in the Philippines, 1995‑2005. Population Research and Policy Review, 31:141‑164, 2012.

K. C. Seto. Exploring the dynamics of migration to mega-delta cities in Asia and Africa: Contemporary drivers and future scenarios. Global Environmental Change, 21:S94‑S107, 2011.

S. Shakya, S. Basnet, and J. Paudel. Natural disasters and labor migration: Evidence from Nepal's earthquake. World Development, 151:105748, 2022.

S. S. Shrestha and P. Bhandari. Environmental security and labor migration in Nepal. Population and Environment, 29:25‑38, 2007.

Y. Spitzer, G. Tortorici, and A. Zimran. International Migration Responses to Natural Disasters: Evidence from Modern Europe's Deadliest Earthquake. Technical report, National Bureau of Economic Research, 2020.

R. Stojanov, B. Duži, T. Danˇek, D. Nˇemec, and D. Prochazka. Adaptation to the impacts of climate extremes in central Europe: a case study in a rural area in the Czech Republic. Sustainability, 7(9):12758‑12786, 2015.

S. A. Stouffer. Intervening opportunities: a theory relating mobility and distance. American sociological review, 5(6):845‑867, 1940.

S. A. Stouffer. Intervening opportunities and competing migrants. Journal of regional science, 2(1):1‑26, 1960.

Y. Su, P. Tesfazion, and Z. Zhao. Where are the migrants from? Inter-vs. intra-provincial rural-urban migration in China. China Economic Review, 47:142‑155, 2018.

F. Sugden, N. Maskey, F. Clement, V. Ramesh, A. Philip, and A. Rai. Agrarian stress and climate change in the Eastern Gangetic Plains: Gendered vulnerability in a stratified social formation. Global Environmental Change, 29:258‑269, 2014.

L. Sun. Rural-Urban Migration and Policy Intervention in China. Singapore: Palgrave, 133:2160‑84, 2019.

C. Tacoli. Crisis or adaptation? Migration and climate change in a context of high mobility. Environment and urbanization, 21(2):513‑525, 2009.

B. Thiede, C. Gray, and V. Mueller. Climate variability and inter-provincial migration in South America, 1970‑2011. Global Environmental Change, 41: 228‑240, 2016.

M. P. Todaro. A model of labor migration and urban unemployment in less developed countries. The American Economic Review, 59(1):138‑148, 1969.

E. Tomoiagă and M. I. Pop Silaghi. Internal Migration in Romania. Revisiting the Harris-Todaro Model of Migration. European Journal of Interdisciplinary Studies, 15(2), 2023.

J. Van Lottum and D. Marks. The determinants of internal migration in a developing country: quantitative evidence for Indonesia, 1930‑2000. Applied Economics, 44(34):4485‑4494, 2012.

Š. Vavrek. Of thesis: Estimation methods of gravity models. International Economics, 40(1-2):23‑39, 2018.

K. Venkatasubramanian and S. Ramnarain. Gender and Adaptation to Climate Change: Perspectives from a Pastoral Community in Gujarat, India. Development and Change, 49(6):1580‑1604, 2018.

C. Villalobos and A. Riquelme. Household constraints and dysfunctional rural‑urban migration. Economic Analysis and Policy, 78:1070‑1088, 2023.

B. Viswanathan and K. K. Kumar. Weather, agriculture and rural migration: evidence from state and district level migration in India. Environment and Development Economics, 20(4):469‑492, 2015.

M. Werz and M. Hoffman. Europe's twenty-first century challenge: climate change, migration and security. European View, 15(1):145‑154, 2016.

J. Wolpert. Behavioral aspects of the decision to migrate. In Papers of the Regional Science Association, volume 15, pages 159‑169. Springer, 1965.

WorldBank. Moving for prosperity: Global migration and labor markets. The World Bank, 2018.

WorldBank. World Development Report 2023: Migrants, Refugees, and Societies, 2023a.

WorldBank. Overview. 2023b.

X. Xu and K. Sylwester. Environmental quality and international migration. Kyklos, 69(1):157‑180, 2016.

Y. Xu, Y. Zhang, and J. Chen. Migration under economic transition and changing climate in Mongolia. Journal of Arid Environments, 185:104333, 2021.

L. Zhigang and S. Shunfeng. Rural‑urban migration and wage determination: The case of Tianjin, China. China Economic Review, 17(3):337‑345, 2006.

O. Zouabi. Climate change and climate migration: issues and questions around an in-transition Tunisian economy. Climatic Change, 164(3-4):32, 2021.

GlobeFeed. URL https://www.globefeed.com/.

CEPII. URL http://www.cepii.fr/cepii/en/bdd_modele/bdd_modele.asp.

EM-DAT. URL https://www.emdat.be/.

IMF. URL https://www.imf.org/en/Data.

INSSE. URL http://statistici.insse.ro:8077/tempo-online/#/pages/tables/insse-table.

OECD. URL https://data.oecd.org/.

United Nations. URL https://www.un.org/en/desa/products/undesa-databases.

UNHCR. URL https://www.unrefugees.org/.

World bank. URL https://data.worldbank.org/.