MAGYC

Migration Governance and Asylum Crises

Methodological Paper on the Correlations between Long-term Trends and Migration Dynamics

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MAGYC: The MAGYC (**M**igr**A**tion **G**overnance and As**Y**lum **C**rises) project seeks to assess how migration governance has responded to the recent "refugee crises" and has since been influenced by it, and how crises at large shape policy responses to migration. This four-year research project (2018–2022) brings together twelve international partners: the Hugo Observatory from the University of Liège (Coordinator), Sciences Po, the University of Economics in Bratislava, the GIGA institute of Global and Area Studies, Lund University, the IDMC, SOAS University of London, the University of Milan, the Lebanese American University, the University of Macedonia, Sabanci University, IfPO/CNRS.

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MAGYC WORKING PAPER

ABSTRACT

This workpackage aims to quantify 'migration crises' and contribute to our knowledge of migratory crisis in the past and in potential future by pointing out the role of different drivers in predicting crisis, by incorporating the impact of environmental factors, by laying out different scenarios based on more stable determinants of migratory moves, and by pointing out to the specific mechanisms in certain migration corridors. To do so, this working paper is a framework paper outlining the methodology to measure migratory crises and assess the structural determinants of these crisis as a way to produce future scenarios. To this end, a three level approach of prediction-estimation-projection is adopted in this workpackage in order to 1) quantify crisis in terms of numbers of outflows from countries of origin for a time period of 1960-2015 and investigate its drivers; 2) investigate the migration corridors and their determinants to estimate the destination of peak flows; and 3)project future crises based on a review of various scenarios of structural and environmental determinants of migratory flows. This paper outlines and justifies the methodology of this estimation approach and situates it in relation to other methods of measurement and estimation. It is hoped that, the findings will contribute to existing debates on migratory flows and provoke new discussions on the emergence of crisis and ways to build resilience based on different scenarios.

Introduction:

Situating migration crisis

The overuse of the term 'crisis' along with the terms 'refugees' or 'migrants' has become widespread in recent decades, even though the history of human mobility and mass migration is as old as the history of humanity. According to Sager (2019), this very language of crisis pervades how politicians, academic scholars, the media, and humanitarian organizations discuss migration. This unaccidental choice of words, this framing of any migration flow as crisis, without referring to the raison d'être of this use or actual numbers of human mobility in question, presents migration as something unexpected, out of the ordinary, abnormal yet temporary, and allows for politicization, securitization and hence legitimization of policies both nationally and internationally, which would go through serious public scrutiny under normal circumstances.

Much scholarly work, along with the deliverables of the other work packages of the MAGYC project, draw our attention to the reasons and implications of this labeling of migration as "crisis migration", in particular the case of the so called "European Refugee Crisis" of 2015. For instance, arguing migration itself may not be the primary source of the "European refugee crisis", Lucassen (2017) sees a combination of different factors for the crisis rhetoric: economic insecurity and social risk linked to neoliberal globalization; changing attitudes toward immigrants and toward Islam; incidents of Islamic terrorism; the rise of far-right parties; and the changes in the EU visa regime which make highly visible migration by sea one of the only ways to reach the EU. Furthermore, Menjivar et al (2019) and Cantat (2020) point out to the implications of the crisis labeling on the shape and form of the emerging international response, on the new cooperations and multilevel governance mechanisms established by the European Union (EU), on the politics of reception and integration in states neighboring Syria and EU member states, as well as on the portrayal of the

events by the media. This work package, however, questions the idea of 'crisis migration' by quantifying migratory flows across time and space in search for an objective criteria of crisis, assessing the determinants of this mobility based on past mobility and by coming up future protections based on scenarios regarding the driving conditions.

The widespread frame of 'crisis' is nothing novel and as indicated by Hoerder (2019), the relationship between crises and migration, which are predominantly consequences of uneven economic development, are empirically traceable throughout history. Questioning the ethics of the use of the term crisis, Sager (2019) argues that the identification of migration as a "crisis" is mostly a value judgement, not a straightforward description of a state of affairs. Scholars also criticize this perspective because of its futility, as it leads to a myopic approach preventing a thorough comprehension and management of migration that comes with an acceptance of migratory movements as an intrinsic part of long-term processes of social and economic transformation (Vezzoli et al., 2017; Castles et al., 2014) Therefore, the particular purpose of this paper is to locate the idea of a migratory crisis in a larger temporal and spatial continuum as a way to complement the aforementioned studies in questioning the idea of a crisis in an empirical way. In other words, by looking at the voluntary and involuntary migratory flows globally and across several decades, the aim here is to show what can actually be considered crisis migration in terms of objective criteria evidenced by actual numbers of flows, and what cannot. This requires a preset criteria to define what crisis migration is.

As argued by Hoerder (2019), every single displacement, either voluntary or involuntary, can be considered a crisis from the perspective of those who are faced with the experience of moving from an origin to a destination. Still, large migrations deem special attention as they involve large numbers of these individual crisis experiences. Therefore, this study focuses on large migrations taken in relative terms, large enough for the origin or destination country

relative to their populations and historical trends and defines "crisis migration" as such. As a result, the numbers of registered outflows and inflows of migrants both forced and voluntary nature will be the focus of this study. As different ratios of these incrases signify different implications, they will be quantified accordingly, for instance a ten percent increase in numbers will be assessed as less critical than a 20 percent increase. This is not to say that migratory movements above certain numbers should be called crisis, the use of this term throughout this paper is only instrumental and signifies a meaning akin to critical/high level flows only. Moreover, the purpose of this work is to help predicting the occurrence of these peaks/sudden increases within the plots in which they occur, and to assist those involved in managing these flows in increasing the capacity to proactively engage and better respond to them before they become 'crisis'.

Why study and predict "crisis"?

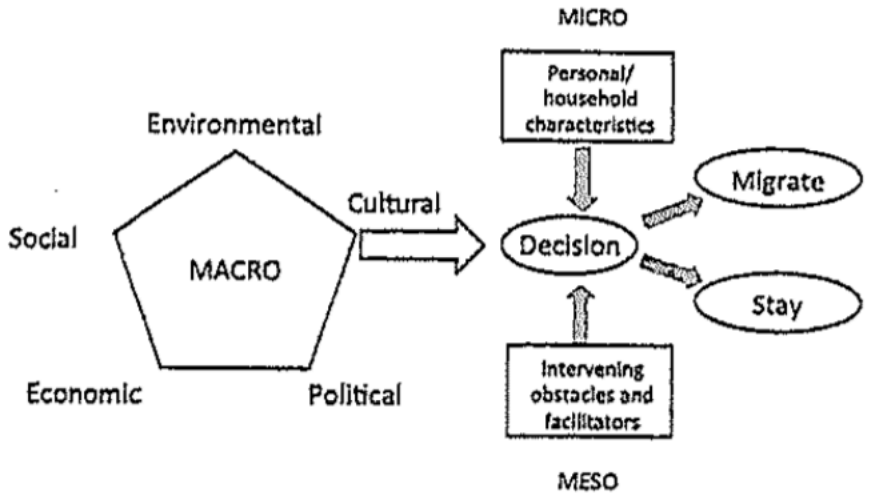
This working paper outlines a three step estimation approach in an attempt to quantify and understand drivers of migration as a way to inform these critical flows. The first step aims to estimate both the long and the short term determinants of crisis outflows, with a focus on the environmental and structural conditions in the origin countries in relation to the migratory out flow data drived from stock data by Abel (2019) for a time period of 1960-2015. This will be followed by an investigation of migration corridors to understand the dynamics of movement vis-à-vis the destination of peak flows. Finally, considering the minimalist, maximalist and middle of the road scenarios of structural and environmental determinants of migratory flows, future projection of crises will be laid out based on the findings of the previous steps in reference to potential origin and destination countries.

The rationale for the use of this perspective is multifold. First and foremost, while

the literature on drivers of migration[1] lays out a series of explanatory variables of flows in numbers, as flows above certain thresholds seem to matter more and as most of the policy debate is taking place in relation to these critical increases, it is important to go beyond the standand dependent variable of flows. In other words, it is important to relate this important literature and sophisticated measurement tools generated through this literature to the occurrence of crisis. This is important to assess how predictive the different determinants are to understand and foresee crisis situations as well as to go beyond the debate on what causes migration. Several meta analyses of this literature illustrate the multicausal mechanisms behind migratory movements. From demographic drivers to socioeconomic conditions, from political instability to climate change, there are a multitude of pull and push factors, which are shown to have an impact on migratory moves both directly and indirectly. Some scholars categorize these different drivers on the basis of macro and micro levels of analysis, while others try to focus on the direct and indirect effects. The approach adopted in this paper is one portrayed below by Gemenne and Leman (2018), which takes both direct and indirect effects into consideration. As the initial model of drivers of these critical increases in flows will be followed by forecasts based on potential changes in these drivers, both driving and mediating forces portrated in the figure below will be incorporated into the models.

[1] See Czaika et al 2020for a thorough review of drivers of both voluntary and involuntary flows

Figure 1: Conceptualization of Migration Processes[2]



In terms of policy implications, while it is important to flesh out the relative impact of these variables, the existence of indirect as well as direct causal pathways in the workings of different drivers suggests the difficulty in pinpointing dominant cause and effect relations. Also, while it is valuable to lay out these different pathways, their utility for policy formation gets lost in their multiplicity. Furthermore, in their efforts to be as comprehensive as possible, the quantitative models of drivers of migration incorporate so many different explanatory variables which are multicollinear and endogenous among themselves that, it is hard to pinpoint the exact meaning of a statistically significant effect of a single variable, while controlling for the effect of all the others that it is theoretically and statistically related to. By focusing on the structural determinants of critical flows, the deliverables of this work package aim to complement the scholarly work with clearer policy and theoretical implications.

[2] Figure from page 12 of McLeman, R. A., & Gemenne, F. E. (2018). Environmental migration research. In *Routledge handbook of environmental displacement and migration* (Vol. 3, No. 16, pp. 3-16). ROUTLEDGE in association with GSE Research.

Upon estimating these critical flows, this workpackage also develops different scenarios in an attempt to contribute to the limited literature on projections. Buetner and Muenz (2016) argue that integrating international migration into demographic analysis via better projections is of growing importance as movements across borders become more frequent and spatially expansive. Furthermore, migration gains become an important part of the demographic dynamics in developing countries facing aging populations and assume increasing importance for the potential economic gains of low income countries from emigres, such as remittances. Also, the scenario approach adopted by this paper will address the issues that emerge from attempts to pinpoint the exact impact of certain variables which are at times non-linear and mostly indirect, as discussed by Gemenne (2011) in relation to the environment.

Last but not least, by showing where and when migration flows have actually reached critical levels, the results may challenge of the widely adopted crisis discourse by policy makers and media. Through various comparative case studies, MAGYC already illustrates that there are cases in which in-migration is securitized even when the numbers of people crossing borders are negligible, or the opposite, where despite high number of migrant arrivals, no 'crisis' discourse is visible (Cantat 2020). This sort of an empirical assessment will complement existing studies as suggested by Menjivar et al. (2019), and will allow future researchers to point to similar cases through the portrayal of data across time and space.

There are potential limitations to the aforesaid contributions this work package aims to achieve. The first of these relate to the availability of the existing data sources in relation to both the dependent and independent variables to be used. These will be discussed in several sections of this methodological paper as they are likely to pose challenges at both operationalization and modeling phases of this work package as well as the implications of the findings. Also, the interdisciplinary nature of the topic at hand complicates any effort to bring

together all of the extant theoretical and empirical perspectives, which do not always speak to each other. Therefore, despite the efforts to bring in the insights of different disciplines, inadvertent omission of literature is unavoidable.

In the remaining part of this working paper, first the literature on the measurement of the dependent variable, i.e. critical migratory flows, will be assessed, followed by a discussion of the use of these different measurements and datasets for this particular endeavor. Subsequently, a separate section on projections and scenario building will compare the different methods available and their aptness for predicting critical migratory flows. Consequently, the methodological perspective adopted for this paper will be laid out for each step of the modeling, generating a base model of drivers of migratory crisis from the perspective of both origin and destination states, which then will be used as the basis for forecasts of future crisis.

Critical assessment of the literature

Despite the bourgeoning literature quantitatively assessing migratory flows in the last decade or two, quantifying global international migration flows remains an important challenge complicating comparative efforts. As argued by many scholars, existing data on global bilateral migration flows are incomplete and incomparable mainly because of cross country differences in the definition and measurement of flows, even when they are recorded. Also, the absence of international standards and existing national priorities adapted in registries, and the limited availability of record keeping in the developing world impede systematic research (Azose and Raftery, 2019; Bell et al. 2015, Abel and Sander; 2014, Rees et al. 2000). This also has an impact on projection attempts. As a result, as compared to the other population projections, despite being an important source of population gain, there is limited demographic analysis in improving migration estimates (Buetner and Muenz, 2016)

Stock data vs. Flow Data

Of the two sources of commonly used data, namely stock data and flow data, the missing values and different definitional problems affect both, but the latter the most. Recently, there are creative efforts to improve through different imputation techniques. While their improved datasets are not available for the use of this paper yet, HumMingBird is one such Horizon 2020 project, which recognizes how missing data/data gaps constitute a notable obstacle for researchers and policy maker alike, on their way to understand and respond to migration patterns and to develop scenarios. It also has a module on imputing missing values using big/non-traditional data sources, i.e. from social media and telecommunication.[3]

Essentially, flow data that is based on civil registration systems are usually supplemented with asylum flows from UNHCR. As Willekens (2016) points out, this data is one of migration counts, updated regularly and hence continuous in time is updated regularly and hence continuous in time. In addition, this data counts migrations as opposed to migrants, which is theoretically more apt to capture migratory flows as a person may migrate more than once in his or her life. Stock data, in contrast, is based on the sequential stock tables, which are published by the United Nations and show the number of people living in a country other than the one in which they were born. This data is basically a snapshot of migrants and their origin country at a given time, displays the responses to census questions informing population registries as well as the statistics of refugees. While this data is appropriate for certain questions, such as examining long term effects of certain drivers as in the case of Beine and Parsons (2016)'s paper on the direct and indirect impacts of climatic factors on international migration, it does not fully capture dynamic movement dimension of migration from one country to the other beyond snapshots, quite

[3] https://hummingbird-h2020.eu

necessary in understanding shorter term effects as well as measuring crisis.

Abel (2017) elaborates on the weaknesses of simple stock data further, arguing potential misrepresentations of the contemporary migration patterns as it only takes note of the place of birth and current residence of individuals. This does not allow for differentiating those individuals who return to their countries of origin, or high mortality among foreign populations, a point also argued by Massey et al. (1999, 299). In addition, migrants are more likely than non-migrants to continue migrating, and their recent moves are also not accounted for in stock data, which may inflate the numbers in countries with long migration histories (Abel 2017).

A considerable part of the literature using this flow data, which is transitionary in essence, focuses on OECD countries as destination countries (Mayda 2010; Backhaus et al. 2015). This is due to the gaps in the data from developing countries and the missing values across time. Others use UNHCR asylum data to analyze the flows of refugees only, again to OECD countries (Abel et al. 2019; Schutte et al. 2020), as in the case of Crossmig Project outputs.[4] Nevertheless, there have been efforts to improve the flow data, one example being the DEMIG project.[5] In particular, compiled as part of the DEMIG project, Demig Total database reports immigration, emigration and net migration flows collected from various sources for up to 161 countries covering various periods of time from the early 1800s to 2011, disaggregating total flows of citizens and foreigners whenever possible.[6] The database is a major improvement for the flow data, but still it is heavily interrupted across time for a large set of countries as the data recording efforts by states have not been improved much over time. All in all, despite the improvements in data collection, the projections that are targeted for this work package require longer time frames and wider geographical scope than available. In particular, this work package considers

[4] https://migrationresearch.com/
[5] https://www.migrationinstitute.org/data/demig-data/demig-total-data
[6] DEMIG (2015) *DEMIG TOTAL, version 1.5*. Oxford: International Migration Institute, University of Oxford. www.imi-n.org

all countries of the world as potential source and destination countries and the deficiencies in the flow data regarding the rates of immigration into middle income countries creates a major limitation for the purposes of this work package.

These tradeoffs regarding discrepancies between the demand for flow data and availability of migrant stock data are nothing new to scholars urging them to come up with novel ways to improve the data sources. One such effort is the Global Migrant Origin Database compiled by the University of Sussex and the World Bank, with the purpose to recalculate the stock data to yield itself better for the measurement of migration flows. This database contains dyadic migration stock estimates for 226 countries based on data primarily from national censuses around the year 2000, but also from population registers and some other secondary sources, to compile bilateral stock data for 162 countries (De Haas et al. 2019). They are stocks, not population flows in a strict sense, but for international migration, they are the equivalent of "lifetime migration" in studies of internal migration[7]. Unfortunately, despite the immense efforts to expand the geographical scope of the dataset, its temporal coverage as a snapshot limits its use for this work package, which focuses on changes of flows leading to migratory crisis over time.

A more recent creative effort by Abel and Sander (2014) and its expanded versions Abel (2017) and Abel and Cohen (2019) are the gateway to estimations and predictions for this work package. Using the stock data available across a wider range of countries and over longer periods than flow data, through an indirect estimation method, Abel derives country to country migration flows. In particular, this work package will make use of Abel (2017)'s estimates of global bilateral migration flows between 1960 and 2015, which are

[7] http://www.sussex.ac.uk/Units/SCMR/drc/research/typesofmigration/global_migrant_origin_database.html

the most expansive geographically and most advanced technically due to the high number of parameters used for imputation.

The proposed dependent variables of this study, namely the multiple operationalizations of critical migratory flows, which are outlined in detail in the following section, require data on migratory flows with a sufficient time span that would lend itself to projections under different scenarios. Furthermore, these different definitions of critical level flows require data on developing countries as both origins and destinations, the availability of which is very limited in existing measures of flow data due to missing values and years. The most apt source that addresses both of these concerns is Abel's estimationsof flow data derivied from bilateral flow tables estimates from sequential bilateral stock data via birthplace specific flow tables (Abel 2017:pp 817).

The idea behind these estimations is to use changes over time in bilateral migrant stock sizes for estimations of flows. These changes may of course arise from three different sources in addition to an increase in migratory flows, namely an increase in the size of the native born populations from births, as well as reductions in the size of foreign and native born populations from deaths, and an increase in migration flows (Abel 2014; 2019). Clearing up the effect of these in order to get migration flows, Abel implements a two round approach supplemented by demographic data. Log linear models, a form of Poisson regression model used to predict or explain count variables, in this case number of flows, where each of the parameter values are obtained using the known marginal sums and diagonal cells in stock tables with iterative proportional fitting.

These parameters for Abel (2017)'s method of imputation along with his use of three versions of UN stock data along with Özden et al.(2011)'s World Bank data enable a sensitive and comprehensive approach both geographically and temporally in estimating the missing values/gaps of flows. At a two-stage

estimation, first flows over 10 year periods with alternative combinations of gender, demographic and stock data are predicted followed by an estimation of five year period flows between 1960 and 2015. These estimations produced flows of a minimum number of migrant transitions required to match the changes in the given stock data, controlling for births and deaths in each country. Earlier versions of this data have been used as a way to assess different drivers of migratory flows in the traditional gravity model form, allowing for testing the impact of some of the important structural factors on a greater sample, especially by including middle income countries as destination countries (Migali et al 2018) This data will be the best fit for the purposes of this work package as it allows for global crisis estimations based on historical crisis data.

What is a crisis of migratory flows?

The World Bank Global Migration Database as illustrated by de Haas et al. (2019) shows that between 1950 and 2017, the relative number of international immigrants has remained rather stable and varied between 2,7 % to 3,3 % of the world population. Some even argue that the numbers may have been even higher in the past but have gone unregistered due to more relaxed border and national registry regimes. What seems to have changed is number of recipient countries, with certain group of countries being more subject to this movement. In particular, in the 1960's, Europe was the origin of the 50 percent of the world migration in the form of intra- and extra-European migration, which was replaced by Asia with 43 percent as we get to 1980s, and by 2015, the total migration flows from Europe to the rest of the world had decreased to 14% of the total flows. To complement this, data illustrated by Özden et al. (2009) show the degree to which international migration is diversifying as migrants increasingly widen their choice of destinations, with migrations between more country-pairs than at any other time in history especially from East Asia and Pacific regions.

Still, even when historical accounts and current trends are considered, the apocalyptical tone in the European response to the flows in 2015 cannot be purely justified by numbers as it was very similar to the flow of asylum seekers from former Yugoslavia the 1990s, which in fact lacked the label of "crisis" (Bonjour 2011, Lucassen 2018).

Aware of the discursive and subjective ways of conceptualizing the crisis and in an effort to assess their aptness using existing objectives, yet not fully complete measures of migration, this work package explores the different meanings a crisis may entail numerically only. The first potential meaning of a migratory crisis could mean an increase in the ratio of immigrants to the total population, which has been stable around 3% on average. However, given the fact that historically there have not been major changes in this ratio, this definition would have limited use in assessing existing uses of crisis and could hardly work as a benchmark to project on future migratory crisis. Alternatively, a migratory crisis may mean a sudden increase in the numbers of emigration from a country, a peak of outflow, indicating a crisis from the perspective on the sending country as well as regionally and potentially globally. Furthermore, it may indicate a sudden increase in the number of the arrivals into a country, a peak of inflow from one or more countries, indicating a potential crisis from the perspective of the receiving country and its region.

All of the aforesaid three kinds of increases in flow numbers can follow a linear path with either a steep or flatter line but they can also be in terms of sudden increases as in a threshold function. Furthermore, Cantat (2020) in Work package 3 of MAGYC project suggests, in addition to sudden peaks, a crisis may emerge from the persistence in numbers. In other words, rather than a rapid in the number of migratory flows for one year, it may mean an increase in the number of out- or in-flows that are to last several years, more like a step function. The deliverables of this work package consider all of these different

possibilities in detecting the existing 'crisis' based on the historical data and projecting based on different scenarios. Therefore, the way the main dependent variable "migratory cisis" measured will encompass all of these different possibilities of the concept.

How Projections are made: The Scenario Approach

According to Sander et al. (2014) forecasting migration is difficult, mostly due to a lack of underlying transition theory and adequate baseline data. Despite the high degree of sophistication in measuring and modeling fertility and mortality in population projections, measurements and models of geographic mobility are rather limited. Nevertheless, as argued by Bijak (2016), the contribution of migration to policy and planning next to fertility and mortality is too important to ignore as any failure to capture human mobility also taints the reliability of population forecasts.

The existing literature on future projections of migration flows have diverging assumptions and hence diverging conclusions about the growth and overall size of migratory flows due to a range of challenges. According to Bijak and Czaika(2020) and Bijat (2016, these issues mainly relate to high level of uncertainties in not only our knowledge and definitions of migration and its discrepant statistics, but also the uncertainty about migration processes in general. One can add to that, the limited utility of a single theory as a driver and the literature on push and pull factors also being extensive with many of the drivers involving additional uncertainties such as political conflict. Furthermore, some of the projections that are made by national institutions rest on existing national assumptions in terms of demographic indicators or growth rates when in fact comprehensive forecasting requires assumptions to be made on other nation states, even at global level (Buetner and Muenz; 2016).

According to Buetner and Muenz (2016:8) one issue with the existing estimates of UN Population Division, Wittgenstein Center or the US Census Bureau is the

lack of migration theory as the basis of projections and the trends are based on the most recent situation, which is allowed to affect the immediate future, after which persisting trends are assumed to be constant, followed by a final period of convergence to zero net migration. As each institutions' experts were given an ample room to deviate from the general guidelines and alter the duration, Buetner and Muenz's (2016) comparison reveals the dissimilar trends, differing magnitude of migration and ranking of top immigration and emigration countries.

According to Vezzoli et al (2017) conventional approaches of projections and forecasts, which tend to project recent trends into the future using linear extrapolation, based on the *ceteris paribus* assumption that future power relations, global economic geographies, geopolitical constellations, and policy regimes will remain stable. In other words, they predict 'more of the same', which is highly unrealistic, considering the fundamental and largely unanticipated shifts European migration has witnessed since the 1950s – from being the main source countries to being the main destinations of global migration flows.

The approach this work package will adopt is one of balancing these issues with a scenario approach based on both predicting the dependent variable of critical migration derived from our models of migratory flows based on past values, but also incorporating the different expert scenarios regarding the structural and environmental determinants of migration. In other words, predictions of future migrations will be based on the different scenarios as to the future values of these drivers. According to Bijak and Czaika (2020), in the face of uncertainty affecting migration forecasts, combining information from different sources as targeted by this work package, is one way to deal with the issue and improve our knowledge of future human mobility. Furthermore, in doing this some of the more stable features of migration, such as distance between countries or the share of the youth, which are either time invariant as in the case of the former or elicit slow change as in latter, in order to bring some

certainty into predictions. Nevertheless, caution will be exercised in generating these forecasts with the use of a scenario approach by the provision of different scenario outcomes. As argued by Bijak (2016), appropriate communication of uncertainty is crucial rather than having ambitiously precise but incorrect estimations. Consistent with this position, the scenarios generated by this work package will provide different possibilities based on the changing parameters, requiring different preparedness and building of resilience on the side of the policy makers.

The use of systematically formulated migration scenarios and wider utilization of expert knowledge for predicting future migration trends have been defended by several scholars starting with Ahlburg, Lutz, and Vaupel (1998), Global Migration Futures Project and implemented by OECD in its 2016 Perspectives on Global Development. Several extensive attempts have been made in producing migration and population scenarios some of which rest on quantitative (Bijak et al. 2019) or qualitative expert assessments.[8] For instance, Bijak et al. (2008) provided various global scenarios based on economic development levels and restrictions of migratory policies, to foresee migratory flows into EU countries. Accordingly, his base scenario, with a moderate, yet sustained improvement in the economic, political and social situation worldwide, resulting in a moderate overall population inflow to Europe and a gradual shift in places of origin from the neighboring countries to the other developing regions of the world as opposed to a low scenario, assuming economic stagnation both in Europe and in the rest of the world, resulting in strong migration pressure on developed countries but restrictive policies and finally a High scenario, assuming dynamic economic growth and social development, resulting in a need for an inflow of foreign labor and thus leading to relatively liberal immigration policies.

[8] For an evaluation of these different projects producing scenarios see Vezzoli et al. 2017

In addition to existing research based on scenarios, a recent Horizon 2020 project, HumMingBird, adopts a multidimensional and multidisciplinary approach for building up future migration scenarios by gathering quantitative and qualitative indicators. It will be the first attempt where different dimensions of scenarios such as deterministic models, migrants' agencies, two-way traffic between migration and policies, innovative Big Data analytics, alternative data sources will be investigated in a holistic manner. Another important attempt at merging quantitative and expert views of scenarios in an attempt to provide early warnings to policy makers is the H2020 project of Quantmig. The knowledge base for their scenarios will include a comprehensive review of key migration drivers in origin, destination and transit countries, with particular focus on mobility of third-country nationals, various aspects and stages of migrant decision making, and on the characteristics of prospective migrants. Unfortunately, the data on the different scenarios to be provided by both of these projects will not be available in the life span of this work package but may be used to supplement, update and compare the results of the deliverables of this work package once they are shared with the scientific community.

As building scenarios is beyond the scope of this work package, existing and completed scenario building exercises are reviewed to determine which scenarios to project so as to avoid any arbitrariness in coming up with different projections. In this work package, the forecasts will be based on the magnitude of impact of different drivers, which will initially be determined based on historical data provided by Abel (2017) discussed above. Hence, predictions of future migrations will be based on the different scenarios as to the future values of these drivers.

ESTIMATION PROCESS

STEP 1:

Projections of critical migratory flows based on scenarios of their determinants requires a categorization and quantification of these critical increases in flows based on historical data. Therefore, the parameters of flow increases for countries of origin need to be identified. To this end, Abel's flow data converted from stock data will be accumulated for each sending country based on outflows in gross numbers only. For this, the number of immigrants from country A in all other countries in the world will be added up for a given year, to be followed by the next year. The predicted model, while focusing exclusively on push factors, will be better able to focus on cross country and time variant differences in origin countries and what crisis means from the perspective of source countries, what factors derive them and when it is more likely to happen.

There are several alternative ways to measure the "intensity" of flows:

a) Rate of change in this variable;
b) Ratio of this number to the population of the source country;
c) Just the nominal values of the variable (not the best alternative, but in defining a "migration crisis" a number without any normalization as in the case of a or b above a certain threshold can also be considered. But in using this measure, data should be de-trended at the country level because every country has a different population growth level which may have an impact on the change in these rates, contaminating the data source.

There are clear benefits of dynamic panel data models to be used for these kinds of analysis also as a way to differentiate these models from the existing ones in the literature.

These models have various advantages:

1. As this prediction will involve different exploratory variables which may take a longer or shorter time period to have an impact on migratory flow crisis, the models should incorporate this expectation. For instance the impact of a temperature increase, or increase in education levels may not be instant and may have a visible impact on migration only after a certain amount of time which is hard to know a priori.
2. In a time series data structure, these models allow for incorporating several lags of the dependent and independent variables. This is also an important robustness check component, as it addresses issues of endogeneity.
3. Furthermore, these models are capable of taking the issue of cross section dependency into account both in terms of coefficient and error estimations.

As a result, it is determined to use a dynamic panel data estimation techniques that takes the aforesaid cross-sectional dependency leaving us with either a Cross Sectional ARDL model or Dynamic Common Correlated Effect Model. When using Auto Regressive Distributed Lagged (ARDL) Models, the dependent variable at time "t" is modelled as a function of its own values at different time lags and of the values of several simultaneous or lagged predictor variables, allowing for other drivers of migratory flows to be incorporated.

The final equation will be dependent on the specific estimation method to be chosen based on certain econometric tests and will be a variant of the following base model.

$$\text{OUTMIGRATION}_{xt} = \beta_0 * Constant + \beta_1 * \text{STRUCTURAL DETERMINANTS}_{xt-q} + \beta_2 * \text{ENVIRONMENTAL DETERMINANTS}_{xt-q} + \gamma * \text{GEOGRAPHIC \&OTHER TIME INDEPENDENT VARIABLES} + \varepsilon_t$$

In terms of the specific benefits, first, the ARDL models allow for measuring the impact of short and long term effects separately. Secondly, with these models we can address the joint effects (interaction effect of different variables) and separate effects of variables. This is quite important especially when the interactive effects of certain determinants and especially of environmental variables are considered. Veronis et al (2018 :50) underline this point in their criticism of the literature and point out to the interplay between environmental and non-environmental factors in migration decisions, an issue picked up by many late quantitative studies with supporting results. Finally, these estimations will be used to be the basis of several scenarios, which could point out to potential other effects these origin countries should be prone to, or likely to be heavily affected.

STEP 2:

A second model will be estimated with the bilateral flows as the dependent variable to also focus on recipient countries. This time, Abel's flow data will be utilized as consisting of country dyads. This is important in creating a base gravity model to identify the main destinations of the flows which are outlined in detail in the previous section.

Based on the results of the estimates from the previous model, peak predictions of migratory flows will be matched with medium and high outflow countries. As a contribution to the literature, a new dataset will then be compiled with dyadic data, enabling us to identify where this migration is likely to be destined, which countries are likely to be hit by these crisis level flows and if certain countries would be easier destinations due to factors such as colonial history,

network effects, trade relations, financial flows, political affinity or other cultural ties. This would show the relative impact of this crisis in different destination countries.

The gravity model is the oldest model of migration flows and focuses on the attraction between two objects as it is drawn from Newton's law of gravity and in this case between two states, the former being the country of origin with the latter being the destination. Accordingly, Mij =k (PiPj/$d^h_{ij,}$ where the P_i is the population in I, P_j is the population in j and d_{ij} is the distance between i and j, k and b are parameters to be estimated from migration data (Willekens 2016). Nevertheless, while an important predictor, as distance is not the only indicator which would cause migratory movements and hence over time many other indicators tapping different push and pull factors have been added to these models.

For this purpose, a data set with dyadic data measures in terms of so far under investigated linkages between the origin and destination will be constructed (Correlates of War[9] data for trade dependency, financial flows, years passed since the Military Interstate Dispute, Distance, Contiguity, Colonial, Cultural and Network linkages, allowing for evaluations of the impact of variables in the country of origin, country of destination, and changes in their relationship) This way, the predicted model based on this dependent variable can focus exclusively on pull factors as well as the cross country and temporal comparisons across the countries of destination. To reiterate, the main purpose of these models is to build a base model to be used in predicting different scenarios in the following sections.

[9] https://correlatesofwar.org/data-sets

STEP 3

As argued by Calian (2013), model-based forecasts are subject to uncertainties due to the data and measurement method, modelling, parameters as well as future uncertainty. Furthermore, the ability to give valid point estimates and prediction intervals for the forecasted values requires steering away from classical regression type models as the time series data of migration is non stationary and autocorrelated.

At this stage, the focus will be forecasting migratory crisis flow, based on the previous two base models estimated. As discussed in the scenario section of the literature review extensively, rather than making point estimations with several different confidence levels, projections will be based on different scenarios with the drivers of migration being the main parameters. Put differently, the origin- and destination-country specific factors identified by models 1&2 above in making projections about migration will be used.

Making predictions about all those factors is beyond the scope of this study; hence we will be using estimations provided by respectable studies (both academic literature and non-academic sources). In doing this, two main dimensions will be taken into consideration. One dimension of the scenario building will refer to structural determinants incorporating demographic and socio economic drivers of migratory flows, while the second dimension will refer to the environmental dimension, to be added by the third deliverable of this work package. In particular, for population projections, the scenarios generated by the population division of the Wittgenstein Center on age, sex and education, which are based on 550 surveys and regional workshops (Samir and Lutz 2014) will be utilized for the estimations in this work package. These are called the SSP1 scenarios and range from sustainability to fragmentation, from inequality to conventional development[10]. As to the climate change scenarios, for the weather and climate conditions at seasonal and decadal

[10] For details on the different calculations of SSP narratives see Samir and Lutz 2014: 249-250

scales, Smith et al. (2012) for the future sea level changes scenarios outlined by Hallegette et al. (2012) as per Adger et al (2015) will be utilized.

MEASUREMENT OF EXPLANATORY VARIABLES

As outlined above, the main focus of this research program is to estimate future migratory crisis based on extant scenarios of the evolution of the structural and environmental factors. As outlined above, at each stage of estimation, different forms of certain exploratory variables will be utilized. As these different stages relate to different dependent variables, they necessitate different measurements of the same theories some focusing on origin countries, while others the dyadic relationship between two countries. The belowmentioned descriptions relate to the basic measurement of these constructs and will be recoded according to the different stages of estimation.

i. Structural Determinants

Demographic drivers

Possible explanatory variables examined within this category in the literature include specificities about the structure of the population internally but also its dispersion geographically. Population size, population growth, age structure and especially rates of fertility and the ratio of the youth cohorts to the entire population, family size, household size and structure are found to have an impact on migratory movements along with the rates of urbanization (Migali et al 2018, Bell et al. 2015 Oded and Levhari 1982) High fertility rates do not necessarily result in high migration but younger people are more likely (Migali 2018) to migrate. For the models with the dyadic data, these variables would be converted to a relational measurement regarding the origin and destination country. For instance, the differences between these two countries will be calculated in terms of the percentage of youth in the overall

population, average household size, or fertility rates. For projections, many of these are already incorporated into the Socioeconomic Pathways Scenarios of Wittgenstein Center discussed by Samir and Lutz (2014).

Economic Drivers

Both neoclassical economics and new economics theories emphasize the importance of several factors related to wages, development rates, unemployment rates in driving migration. In terms of the operationalizations of these concepts, there are a range of economic drivers that relate to both origin and destination factors that are found to be important drivers of migration. Labor market and employment conditions (Migali et al 2018) along with wages (Beine et al 2014), levels of economic development as measured by GDP growth rates, per capita income (Bell et al 2015) and fluctuations are influential in individuals' migration decisions at different rates and mostly in non-linear patterns. Studies repeatedly underlined the inverse U-shaped effect of economic development on migration decisions. In particular, for low income countries, development is shown to increase migration in the short run until the purchasing parity adjusted per income GDP rates of 7,000- 8,000 USD, after which migration rates start to decrease (Carling and Talleraas 2016).

While their relative impact may differ from region to region and from the kind of migration decision whether forced or more voluntary, economic drivers have been found be important drivers of migration (Düvell 2018), albeit with changing relationship patterns. For instance, in their assessment of the structural drivers of migration, Migali et al (2018) illustrate while conflicts and state fragility in the origin countries are the strongest predictors, lower GDP per capita is in fact associated with higher levels of people seeking asylum and hence showing poverty may not always be a constraint on migration. In the light of these findings, changes in the ppp adjusted GDP per capita will be utilized for the models regarding origin countries. In their gravity model of 160 origin and 35 destination countries for migratory flows, Lewis and Swannell

(2018) illustrate the role of expected income in addition to extant income. Therefore, the current GDP will be supplemented with expected future income using IMF forcasts for economic growth for both origin and destination countries.

The aforementioned are not the only mechanisms argued for the economically based structural determinants impact on migratory movements, yet they are the most repeatedly and rigorously tested and frequently confirmed effects. In addition to these, scholars investigated the impact of business cycles and job opportunities based on the predictions of dual labor market theory or the level of social protection/public spending in destination countries indicative of welfare magnet theory, both of which with mixed results.

The role of economic vulnerabilities is definitely a lesser explored component of structural determinants mainly due to the difficulties in measuring them. A good example is Mayda (2010) looking into relative inequalities between sending and receiving countries, which this study will also incorporate. Mayda finds mixed support for the poverty constraints and looks instead the differences in the levels of inequality between the origin and the destination country where she finds when inequality in the origin country is lower than the destination, it is the migrants from the upper tail of the income distribution leave for the destination country. For the estimation, this measure will be augmented with the inequality adjusted human development index (IHDI), which combines a country's average achievements in health, education and income with how those achievements are distributed among country's population by "discounting" each dimension's average value according to its level of inequality[11].

Despite the extensive literature using these theories for their estimation of migratory movement, unfortunately the relational nature of these variables

[11] http://hdr.undp.org/en/content/inequality-adjusted-human-development-index-ihdi

seems underexplored in the gravity models using dyadic data. To this end, in addition to the calculation of differences between these countries in terms of these indicators, additional economic linkages will be explored to better understand the move to target countries. In particular, their dependencies in their trade or share in foreign direct investments may offer important insight to the movement of labor and creation of migration corridors. Therefore, a measure of dyadic trade dependence (dyadic trade dependence) will be included in the estimations [12].

The Role of Environment as part of Structural Determinants

The nexus between climate change and migration has been addressed since the early 90's by scholars of various disciplines from economists, environmentalists, demographers to political scientists. These efforts came along with a multitude of projections ranging from very maximalist to minimalist expectations regarding the number of displacements that are to take place as a result of environmental drivers. Some others point out to how this process may depend on anthropogenic processes such as global warming with extensive global effects of through the massive the loss of habitat due to systematical use of the neoliberal development models but geographically isolated events such as land grabs to poisoning of land of water due to mining and construction (Sassen 2016). Czaika and Reinprecht (2020) point out that in the literature exploring migratory flows, environmental drivers have received relatively less attention leaving their impact understudied. The two sets of drivers found to have an impact on human mobility in latest studies are the rapid onset changes in the environment such as disasters, making livelihoods difficult immediately and slow onset changes having a similar effect gradually, mostly resulting from global warming (Neumann et al. 2015).

[12] We use the COW Trade dataset (Barbieri, Keshk, and Pollins 2009) and employ the log of total trade value (imports þ exports) exchanged between dyad members.

Rapid onset changes:

According to the meta analysis of Czaika and Reinprecht (2020), about 35 percent of the literature on environmental drivers investigates the role of the variables in this category such as floods, storms, droughts, earthquakes and man-made disasters with mixed evidence. Quite influential in explaining internal migration, potentially stemming from their temporary impact at times, there is limited evidence as to their statistically significant effect in explaining international migratory flows either directly or indirectly (Afifi 2011, Mishra et al 2014, Beine and Parsons 2015, Islam 2018) For our purposes, International Disaster Database compiled by Center for Research on Epidemiology of Disasters will be used to capture the impact of disasters on migration.

Slow onset changes:

Either through case studies focusing on one or few regions, or through large-N studies, the majority of the literature exploring the impact of environmental drivers of migration focus on the slow onset changes in the temperature and precipitation levels. The qualitative and quantitative studies focusing in specific regions illustrate how temperature increases either through direct or indirect impact create draughts, impact health conditions make resources scarce, thereby making migration a viable option (Khavarian and Gamsir et al 2019). Mishra et al. (2014) point out to the fact that temperature changes may not have the same effect on migratory moves equally across all temperatures. In particular, authors illustrate that this impact is most visible above 25 degrees Celcius leading to increases in internal migration decision, a direct effect that is statistically significant.

Furthermore, many scholars point out to the indirect effects of climate change in general and temperature and precipitation changes in particular on population movements (Gemenne and Leman reader). Beine and Parsons find indirect effect of climatic change on wage differentials In their meticulous and

technically advanced assessment of spatial pattern of environmental drivers of migration in drylands by performing a cluster analysis on spatially explicit data, suggest that land degradation is an important factor of outmigration from drylands globally, and even more important than water availability. For the case of Mexico, the study by Feng et al (2010) projects that by 2080 climate change, through its effect on agricultural productivity, temperature increases may lead to additional outmigration of 2–10% of the current working age population in Mexico. Similarly, exploring the agricultural linkage in relation to climate variability, in their analysis of bilateral flows from 163 countries of origin to 42 destination countries for the period of 1980 to 2010, Cai et al. (2016) find a statistically significant effect of temperatures on out-flows only in the most agriculture dependent countries.

Combining the climate change data with longitudinal household surveys conducted in Indonesia, Mishra et al (2014) show the indirect and non-linear effect of temperature changes on migration decisions through household assets where the relationship starts to be visible at 24 degrees Celsius with this indirect impact growing at each degree temperature increase. On a related note, another indirect effect, this time regarding fresh water resources and rainfall is illustrated by Abel et al. (2017) in their study of international refugee flows for the years 1951 to 2014 using Heckman selection with a gravity model. Authors find that controlling for the economic conditions and political factors, conflict outbreaks are more probably in countries with scarce fresh water resources and lower level of rainfall, hence show the mediated impact of environmental change on migration.

Following the lead of these studies and with the purpose of incorporating the long term and short term impact of environmental factors into our estimations of migrator flows leading to crisis level increases, this work package will measure the slow onset changes via the Standardized Precipitation Evapotranspiration Index (SPEI) data, with population weighted annual mean

temperature, positive and negative deviations in cropland weighed standardized precipitation evapotranspiration index, with multi-scalar drought index that is used for determining the onset, duration and magnitude of drought conditions.

Finally, as to the projections of our estimations, according to Burzynski et al. (2018), there have been a number of "projections" of future population displacement that largely assume all people in areas severely impacted by climate change will move, with remarkable predictions that climate change and especially associated sea level rises will result in the displacement of hundreds of millions of people between countries (Christian Aid, 2007; Myers, 2002). According to McLeman (2011) these "projections" are not based on a detailed analysis of future trends in climate patterns and Bardsley and Hugo (2010) point out to a lack of understanding of environmental drivers of migration in coming up with them. Therefore, as mentioned in the STEP 3 part section of this deliverable, regarding climate change scenarios, for the weather and climate conditions at seasonal and decadal scales, Smith et al. (2012) for the future sea level changes scenarios outlined by Hallegette et al. (2012) as per Adger et al (2015) will be utilized. These scenarios will also be checked against the temperature and sea level projections of Burzynski et al. (2018) which are based on the Climate Change Knowledge Portal Data and suggest Minimalist(decrease), Intermediate(gradual increase of +2.09°C) and Maximalist (an increase of +4.09°C) temperature and corresponding sea level projections.

ii. Controls

The first model to be estimated regarding the outflow will also feature several control variables argued to be influential in some contexts regarding migration. These will be conflict related variables and geographical time invariant factors such as society level political violence, repression and crime indicators homicide rates, civil and international conflicts political terror scale, fragile

states index, global peace index as well as highest neighborhood democracy score for the origin countries for each year (Schutte et al 2010).

For the dyadic gravity modeling, these variables will be converted into relational shape and look at the differences between the source and destination countries. Also, a variable measuring the number of years since the two states in the dyad experienced a militarized interstate dispute (peace years) will be included.[13]

Especially in gravity models at stage 2 of estimation, where dyadic data will be used, distance between capitals or geodesic distance, contiguity can be added as control variables as a measure of the distance in miles between the national capitals of the two states in the dyad (distance). We also include a variable to capture whether the two states are either contiguous by land or separated by less than 24 or less miles of water (contiguity) since neighbors may be more likely to have population movement across the borders. While most studies measure this geographical dimension in terms of a dichotomous variable regarding the existence of a shared border, alternative measurements involving more information such as the length of this border is available in Correlates of War dataset and can provide a better alternative[14].

ILLUSTRATION OF A POTENTIAL CASE IMPLICATIONS: DISPLACEMENT DUE TO SYRIAN CIVIL WAR

Having illustrated a methodological path for the models expected from this workpackage, discussing the implications of this persective on a specific case can prove utility in terms of contextualizing the approach. When the focus of the larger MAGYC workpackages are taken into consideration, it would be apt to briefly discuss how this three step approach be useful in understanding

[13] The distance, contiguity, and peace years variables were obtained through Correlates of War Dataset

[14] A summary of the variable descriptions are provided in the Appendix.

Syrian refugee flows. Also, there is rich interdisciplinary literature using both quantitative and qualitative approaches, discussing the role of different structural determinants, in particular economic and climatic variables on the emergence of Syrian conflict, which then triggered forced displacement. Most of these studies demonstrate how intertwined the effects of multiple factors in instigating migration can be, a potential area this work package aims to unpack. Ide (2018) refers to the paradigmatic and high-profile nature of the case which is assessed as a blessing by some scholars due to the data collected and the debate emerged and as a curse by others for dominating the debate on the the relationship between climate change and conflict.

Resulting in hundreds of thousands of fatalities and millions of people being both internally and externally displaced, Syrian civil war which started in March 2011 and still ongoing constitutes a striking human tragedy. What led to this mass displacement has resulted in a vivid debate among scholars with attempts to understand the impact of several structural determinants in addition to the main drivers of political oppressions. Focusing at the onset of this conflict, some of this literature scholars emphasized the economic drivers such as neo-liberal policies of Assad regime, rising poverty and unemployment while others stressed the role of climate factors, particularly the 2006-2009 drought in the Fertile Crescent (Kelley et al. 2015, Gleick 2014, Werrell et al. 2015, Selby et al. 2017, Abel et al. 2019). Several causal paths were explored by these scholars to illustrate the direct and indirect causal paths of increasing temperatures such as direct impact on internal and external migration;

-through increasing agricultural prices, creating a massive loss in agricultural livelihoods and rising poverty and unemployment,

-in conjuction with Assad's policies of eliminating agricultural subsidies and others which led to the depletion of ground water, a major source of irrigation in the absence of precipitation (Kelly).

- trigerring internal migration to Aleppo, Damascus, Dara'a, Hama, and Homs, intensifying existing grievances and facilitating the onset of protests and the subsequent civil war

As discussed by Cai. (2020), regarding the links between the drought and the loss of livelihoods, all available studies agree that a number of political-economic factors increased vulnerability to drought and undermined livelihoods, especially in north-eastern Syria. Anthropogenic processes are also argued to have 'threat multiplier' effect with mismanagement and overexploitation of local groundwater resources, desertification due to overgrazing, the liberalisation of the agricultural sector in the 2000s, the removal of fuel and fertiliser subsidies in 2008/2009, as well as inadequate and unequally distributed drought relief. Still, connecting loss of livelihoods as a result of this process to migration is something that has not been fully established.

Having been extensively employed by policy makers and media, these findings stirred a major debate in the academic literature with the much cited response of Selby et al. (2017), questioning the reliability of this research on various grounds including the aforementioned point. Some of these criticisms that are also supported by later studies are as follows:
-Not all countries in the region are included showing how other countries in the region coped with this drought or other regions did with similar experiences.
-Contemplating but not illustrating the impact of drought on conflict and displacement at the same time or whether the migration flows played a substantive role in the onset of civil war either correlationally or with qualitative evidence through interviews with the participants in the conflict.[15]
In relation to these claims, Cai (2020) argues that, while large-N statistical analyses as modeled by this workpackage are well suited to address these

[15] For a thorough discussion of this debate see Ide (2018)

shortcomings in terms of revealing correlations which are hard to observe in a short time, they are not as common as qualitative studies, which illustrate conflicting accounts based on interviews regarding Syrian case. Furthermore, such studies have the potential to link the literature on Syrian Civil War to other contexts in terms of their theories and methods, another shortcoming illustrated by Cai (2020).

Addressing some of the aforementioned gaps in their correlational study, also guiding the models of this work package, Abel et al. (2019) empirically assesses the existing causal relationships between climate, conflict and migration simultaneously. Using SPEI data on precipitation levels as this work package will do, they illustrate the aforesaid for the different time periods of 2006–2010, 2011–2015, 2007–2009, 2010–2012, and 2013–2015 separately and across the globe, comparing different regions. Their results indicate that there is no empirical evidence backing the existence of a robust link between climatic shocks, conflict and asylum seeking for the full period 2006–2015, except for the period 2010–2012, where global refugee flow dynamics were dominated by asylum seekers originating from Syria and countries affected by the Arab spring, as well as flows related to war episodes in Sub-Saharan Africa. When these cases are removed from the models, the impact of climate variables are reduced considerably. This discussion provides important insights to this project and we hope that the work produced in this workpackage will contribute to this literature. While not focusing on the moderating effect of conflict directly, through interaction terms, the impact of these variables will be accounted for and further clarified by showing how these trends work for multiple contexts, different migrant groups and across a longer time span.

A second way this workpackage will contribute to this debate are through the projections at the third stage. According to a group of leading scholars evaluating the climate conflict migration nexus (Mach et al. 2020), this literature should be complemented with forecasts which account for possible

local global interaction effects and across time. In other words, increased instability may well hold over a given window of time only or context and it is important to establish the generalizability and potential impact of these results. This workpackage also aims to contribute to this gap this with its scenario approach and large dataset exploring these effects globally.

CONCLUSIONS

As argued in the previous sections of this working paper, our ability to estimate models and forecasts is constrained by the availability of data. Even though, it is believed that the most appropriate datasets are selected to measure the dependent and independent variables, the lack of data for certain countries, as well as the time span of the data available will pose some threat to our results. While the former can be offset with the generation of new datasets imputing these gaps in data such as the HumMingBird project and replication of our models with these datasets in the future, the latter is not likely to be resolved any time soon.

It should also be noted that our approach takes a perspective based on using country level macro data, while migration is actually a decision taken subjectively by individuals. The latest review of the literature by Kuhnt (2019) confirms the high importance of macro level causes of migration as opposed to micro level factors with more of a mediating effect. Nevertheless, aware of an ecological fallacy this approach may suffer from and the limitations of this work package in incorporating meso and micro level data such as characteristics of localities/ provincial differences in terms of environment, economic development, personality traits such as openness, risk aversion should be acknowledged. Yet, the structure of the MAGYC projects makes certain that other work packages of MAGYC address these gaps by focusing on specific case studies on NGO networks in Italy, internally displaced in Yemen or local politics in Turkey and Lebanon. Also, more research based on

surveys and panel data to be conducted with populations in countries of origin and destination should examine our expectations, better elucidate the actual causal paths and how the macro level variables we describe are perceived by individuals.

Despite the aforesaid limitations, it is believed that this work package will contribute to our knowledge of migratory crisis in the past and in the future by pointing out the role of different drivers in predicting crisis, by laying out different scenarios based on more stable structural determinants of migratory moves, and pointing out to the specific mechanisms in certain migration corridors. It is hoped that, the findings will contribute to existing debates on migratory flows and projections by the use of an extensive data and by incorporating the impact of environmental factors and give rise to new discussions on the emergence of crisis and ways to build resilience based on different scenarios.

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APPENDIX -MEASUREMENT OF THE DEPENDENT AND INDEPENDENT VARIABLES

Dependent Variables	
Migration Outflows for Step 1	Rate of yearly change in outflows
	Ratio of outflows to the overall population of the source country
	Nominal values of outflow
Dyadic Flows for Step 2	The rate of yearly change in migration flows from country A to Country B
	The ratio of flows from country A to Country B to the entire flows from Country A
	Nominal values of flows from Country A to Country B
Independent Variables	
Demographic Factors	
Population growth	Changes in population size
	Changes in population growth rate
-For the dyadic data	Differences in the population growth rates between Country A and Country B
	Fertility Rate Changes in Country A
	Fertility Rate Differences between Country A and Country B
Youth rate	Ratio of young cohorts to the entire population
-For the dyadic data	Difference in the ratio of young cohorts between Country A and Country B
Economic Factors	
Economic Development	GDP growth rate changes in the country of origin
	Changes in the Per Capita Income in the country of origin
-for the dyadic data	GDP per capita differences Between Country A and Country B
Inequality	Inequality adjusted Human Development Index
Unemployment	Changes in the Unemployment rates in the country of origin
Trade Dependency	The ratio of trade of Country A from Country B to overall trade of Country A (Correlates of War)
Financial Flows	The ratio of financial flows of Country A from Country B to overall financial flows of Country A (Correlates of War)

Colonial linkages	Whether or not Country A has been a colony of Country B
Environmental Variables	
Rapid Onset Changes	
Disasters	International Disaster Datacom piled by Center for Research on Epidemiology of Disasters for the origin Country
Slow Onset Changes	
Temperature	Standardized Precipitation Evapotranspiration Index (SPEI), with population weighted annual mean temperature (Lagged)
Precipitation	SPEI positive and negative deviations in cropland weighed standardized precipitation evapotranspiration index for origin country(Lagged)
Duration and magnitude of drought conditions	SPEI multi scalar Drought Index for origin country(Lagged)
Political Conflict Related Variables and Controls	
Interstate Instability	Peace years (Years of peace since the last MID)
	Peace years (Years of peace since the last MID between Country A and Country B)
Civil conflict	political terror scale
Civil conflict	fragile states index
	global peace index
Regime Related Stability	Democracy score
	highest neighborhood democracy score for the origin countries
Distance	Distance Between Country A and Country B
Contiguity	The length of the border between Country A and Country B