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Measuring and Explaining Cross-Country Immigration Policies*

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Abstract

The intensified international migration pressures of the recent decades prompted many developed countries to revise their immigration regulations and increase border controls. However, the development of these reforms as well as their effectiveness in actually managing new immigration flows remains poorly understood. The main reason is that migration regulations are hard to quantify, which has prevented the construction of a universal measure of migration policy. To fill this gap in the literature, we construct an indicator of the restrictiveness of immigration entry policy across countries as well as a more comprehensive indicator of migration policy that also accounts for staying requirements and regulations to foster integration. These indexes are then used to disentangle the factors determining the toughness of migration regulations. Our empirical framework combines elements from the median voter and interest group approach and accounts for cross-country correlation in migration policies. We find strong evidence of spatial correlation in particular in entry restrictiveness, while the impact of economic determinants of migration policy remains much more modest.

Keywords: Migration, Immigration policy, Spatial dependence, State-space model, Bayesian inference

JEL codes: F22, C43, C21, P16, C32, 057

1 Introduction

In his review of research on the economics of international migration, Hatton (2014, p.47) notes that '*One of the biggest challenges has been to somehow characterise subtle and complex migration policies in*

*The creation of the overall policy measure of immigration toughness is part of the 'Economic and social consequences of immigration' project, supported by LEM, Universities of Lille. To complete the computations, we used the resources of the Flemish Supercomputer Center, which was kindly provided by Ghent University, the Flemish Supercomputer Center (VSC), the Hercules Foundation and the Flemish Government - department EWI. The authors would like to thank participants to the 4th Ghent-Lille workshop, the IXth World Conference SEA 2015, the 6th International Conference 'Economics of Global Interactions' (Bari) and the 5th Annual Conference 'Immigration in OECD Countries' (OECD, Paris) as well as Frédéric Docquier and Simone Bertoli for their valuable comments and suggestions.

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the form of index numbers, something that recent studies have attempted to do.' A synthetic indicator by which migration policy can be measured and which is comparable between countries in terms of their openness to immigration does not exist. As a result, '[p]*olicy formation is central to the immigration debate, yet until recently, it has largely been the domain of political science rather than economics*' (Hatton, 2014, p.46). Moreover, little is known about how a country's migration policies are set and to what extent they have actually managed to shape recent worldwide migration patterns.

For the most part, this gap in the literature is due to the lack of comprehensive and comparable data on immigration policies. As pointed out by Czaika and De Haas (2013) the qualitative nature of migration policies has hindered the development of a systematic method for measuring and classifying migration policies across countries and over time. The reason is that most countries do not set their migration policy in a uniform way by means of overall quotas, but allow for different entry tracks based on multiple criteria.

Only a limited number of data collection initiatives construct migration policy indexes that can effectively be compared across countries and time. Despite the range of available migration policy indicators, none of them offers a measure of a country's *overall openness* towards international migration. Most available indicators tend to focus on specific aspects of migration policy such as citizenship policies, integration policies or non-discrimination policies alone, thereby ignoring potential interaction or compensation effects. In addition, their country and time coverage can be quite limited and the weighting schemes to construct composite indexes from the data are often arbitrary, or lack transparency. In fact, in their overview of indicators of migration policy, Bjerre et al. (2015) note that of the three stages of index building (i.e. conceptualisation, measurement and aggregation), all efforts to quantify policy so far have been limited to the first two stages. Methodological questions regarding aggregation, such as how to combine quantitative and qualitative information, which weighting scheme to choose and how to deal with missing values, measurement errors and heterogeneous data quality have received much less attention.

This paper proposes to aggregate the existing information on the restrictiveness of migration policy using a Bayesian state-space model, a statistically-determined weighting scheme. The novelty of this technique is that it is able to account for measurement errors in the underlying indicators. As such, we can use the information in indicators of varying quality and correct for the (in)accuracy of the estimated migration policy indexes in any subsequent computations or regressions. In addition, by making use of the time-dependence in the underlying indicators, the state-space model circumvents the problem of missing observations. As a result, it provides more stable and reliable estimates while significantly increasing data availability and coverage without imputations or other ad-hoc manipulations. We use this methodology to

combine all publicly available data sources that are informative on migration policies into an index of entry restrictiveness as well as a more comprehensive indicator of migration policy restrictiveness (available upon request). The latter also accounts for regulations concerning stay requirements and integration (e.g. the rules regarding family reunion), as those influence the ease of residence of an immigrant in a host country and can be seen as indirect entry restrictions.

After constructing these synthetic indexes of migration policy, we proceed to identify and disentangle the determinants of legal barriers to immigration in OECD countries. The literature on the determinants of immigration policy is scarce and applies either a median voter approach (Hix and Noury, 2007; Milner and Tingley, 2011; Facchini and Steinhardt, 2011) or an interest group approach (Facchini and Mayda, 2008). These studies bypassed the construction of an indicator of immigration policy by restricting the focus to the voting behaviour of legislators on immigration law projects or proposals (e.g. in the US house of representatives), or the attributed number of visa. The new indicators that we construct, in contrast, allow for a cross-country panel analysis of economic and political determinants corresponding to both median voter and interest group approaches. Moreover, it allows us to consider the spatial correlation in migration policies. Countries take the behaviour of neighbouring governments into account when managing their own immigration flows, as was shown by Timmer and Williams (1998) for the late 19^{th} and early 20^{th} century and Boeri and Brücker (2005) for the EU15 countries after the enlargement to Central and Eastern Europe.

In the next section, we briefly describe the existing migration policy indicators which we will use to construct our migration policy indexes, as well as the construction of our indexes of migration policy using the state-space model. In the third section, we discuss our findings regarding the determinants of migration policy from a cross-country analysis. The final section concludes and discusses topics for further research.

2 The measurement of migration policy

2.1 Overview and selection of individual migration policy databases

For the selection of individual measures of immigration policies, we rely on five criteria as suggested by De Lombaerde et al. (2008): availability, relevance, comparability, timeliness and accuracy. Specifically, we select all law-based measures that are publicly available (both levels and changes) dealing with economic migration in recent decades (excluding regulations that apply strictly to asylum policy).[1] We do

[1] These could be included in a future extension of the migration policy index. As asylum is driven in the first place by specific motives (human rights) and is internationally regulated by the Geneva Refugee Convention of 1951, we preferred to leave out asylum rules at this stage.

not consider outcome-based measures of immigration policy because these conflate the results of a country's immigration laws (such as the scarcity of visas or immigration quota) with its intended objectives (Clark et al., 2007; Hatton, 2004; Berthélemy et al., 2009; Hatton and Williamson, 2009). Moreover, outcome-based measures are 'a mix of policy and incentive' (Hatton, 2014) and therefore do not just reflect the policy dimension.[2] This section briefly elaborates on the measures that comply with the selection criteria. More detailed information on each of these sources can be found in appendix A.

Several studies provide a measure of policy stance by identifying major changes in different policy dimensions which allows to keep track of the evolution in migration policies over time. These are typically combined into an indicator of the timing and direction of policy changes, where a shift in the index value reflects a significant increase or decrease in the tightness of a particular dimension of immigration law. In particular, Ortega and Peri (2009) and Mayda (2010) create dummies tracking the change in OECD policies that target economic migrants (OP).[3] More broadly, the UN's International Immigration Policies Database (IIPD) provides accurate and objective information on the existence of certain policies on immigration and emigration. None of these dummies, however, provide information on the initial level of restrictiveness nor on the relative magnitude of the change; i.e. no distinction can be made between gradual policy adaptation versus big bang reforms (Czaika and De Haas, 2013).

One exception is the DEMIG POLICY database compiled as part of the Determinants of International Migration (DEMIG) project (see de Haas et al., 2015). It describes the direction and magnitude of 6500 changes in immigration and emigration policies in 45 countries, forming the largest change-tracking database completed to date. Unlike previously constructed databases, it disaggregates major policy changes into their individual policy measures and specifies which migrant group was targeted by each policy measure. However, its unit of analysis is a policy change occurring in a specific country and year rather than the country-year pair itself and the database was not constructed for the purpose of cross-country comparisons (de Haas et al., 2015). As a result, we cannot use the DEMIG POLICY database in the construction of our measures of immigration policies. Nevertheless, the disaggregation provides information on migration policy changes towards specific migrant groups (e.g. high versus low skilled workers). As such, DEMIG POLICY provides an indication of changes in selectivity of migration policies, which will prove particularly useful in Section 2.5.

Only a handful of data collection initiatives construct indicators of migration policy that can effectively

[2]The effectiveness of migration policies cannot be tested using outcome-based measures without accounting for potential endogeneity stemming from the fact that these measures are influenced by the same factors as the immigrant flow itself (Czaika and De Haas, 2013).

[3]Hatton (2004) and Hatton (009b), on the other hand, develop an index capturing changes in the toughness of asylum policies, which we exclude for reasons outlined above.

be compared across countries. The Migrant Integration Policy Index (MIPEX) developed by Niessen et al. (2007) identifies integration regulations for immigrants in 38 Western countries between the years 2007 and 2014. In addition, the migration component of the Commitment to Development Index (CDI), designed by Grieco and Hamilton (2004) and published annually by the Center for Global Development, ranks 27 of the world's richest countries on their dedication to policies that aid poor countries by opening their borders to migrants.[4] The Multiculturalism Policy Index (MCPI) developed by Queen's University provides a measure of the extent to which 21 Western democracies are accommodating and supportive of ethnocultural minorities at three points in time: 1980, 2000 and 2010. As such, it can be informative about the well-being of immigrants and the openness of the countries to immigration. Finally, the Inventory of Migration Policies (IMP) constructed by the Fondazione Rodolfo DeBenedetti analyses changes in the openness of immigration policy targeting economic migrants in twelve EU15 countries over the period 1990-2005 (Jacobs, 2011).[5]

Data availability is expected to substantially improve further in the future by a number of ongoing projects such as the International Migration Policy And Law Analysis (IMPALA). The latter attempts to measure immigration policies in a fundamentally different way, distinguishing between different 'entry tracks' (which can be considered the most elementary level in immigration policy) and registering relevant laws and regulations for each of them (Beine et al., 2015). In terms of transparency and comprehensiveness, i.e. quality of the data, this will constitute a major step forward. However, as Beine et al. (2015) note, projects like IMPALA will probably not resolve all the outstanding issues in the construction of a composite index of (the restrictiveness of) a country's immigration policy. When new datasets like IMPALA become available, they can be fairly easily integrated in future versions of the migration policy indexes.

2.2 Constructing the Migration Policy Indexes

All together, these sources provide us with a database of over 250 indicators of migration policy (the full list can be found in appendix B). These were classified into the three categories traditionally distinguished in migration policy: (1) entry policies (including family reunification); (2) stay policies (permanent as

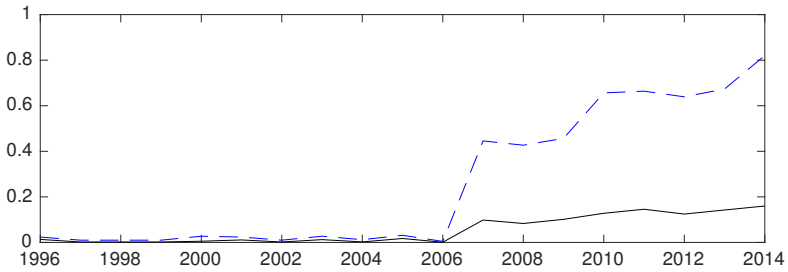
[4] For an application using this indicator to investigate the impact of aid on migration, see Berthélemy et al. (2009).

[5] Other comparable indicators which we do not consider (respectively because they fall out of our time range or because they are not publicly available are those constructed by Bertocchi and Strozzi (2008) and Thielemann (2004). The former created the migration institutional index for 14 OECD countries for the period 1870-1919, combining citizenship laws, land distribution policy, public education policy, and attitudes toward immigration, all of which enter the index with equal weight. Thielemann (2004), on the other hand, constructed an asylum deterrence index for 20 OECD countries between 1985-1999 based on the OECD's Trends in International Migration and the US Committee for Refugees' World Refugee Survey. The index aggregates a number of dummy variables to obtain a yearly indicator of asylum deterrence at the country level, but it has not been made publicly available.

opposed to temporary migration); and (3) integration policies (including migrant rights). The main focus of the literature trying to explain the development and consequences of migration regulations has been on admission procedures, i.e. the first category. Nonetheless, using this database we can construct three different migration policy indexes MPI^E, MPI^S and MPI^I, respectively of entry, stay and integration policies, that asses the restrictiveness of each of these sub-fields of migration policy, as well as a comprehensive indicator MPI^C reflecting the overall stance of migration policy.

However, combining the different indicators of migration policy is less straightforward than it seems. The biggest problem when aggregating the information are the differences in availability of the various databases, as figure 1 illustrates. The black line shows the number of available data points in each year as a percentage of the total number if all indicators were available for each country. Data availability between 1996 and 2006 is never more than 3%, it jumps to 10% in 2007 and continues to increase slowly to 15% in 2014. The sharp increase is caused by the availability of MIPEX data in the second half of the 2000s. While less severe, the problem persists when the sample is limited to the 38 countries for which we have information on both the level and the change in the restrictiveness of migration policy (the blue dashed line).[6] Any index that ignores this availability problem will be distorted, making it impossible to distinguish actual changes in migration policy from changes in the availability of the underlying data.

Figure 1: Data availability for the entire world (black line) and the estimation subset (blue dashed line)



Note: Percentage of the countries covered in each year, averaged over all indicators.

A factor that further complicates the aggregation of these indicators is that their characteristics can be quite different: some variables are continuous while other are dichotomous and a number of indicators capture only changes over time but cannot be compared over a cross section of countries (i.e. OP and IIPD). If all indicators were measured on an interval scale, without missing values, and if a quantitative indicator of their importance were available (like the number or share of total migrants affected), the indexes could be created using a classical index number technique (Paasche, Laspeyre or Divisia). However, the difficulty is precisely that the available information does not satisfy these conditions: the indicators are frequently measured on an ordinal or binary scale; missing values are

[6] This sample corresponds to the members of the EU and OECD, excluding Chile, Mexico, Israel.

pervasive; and a straightforward option for the choice of the weights is lacking.

In order to take these problems into account while making as few additional assumptions as possible, we use a state-space model to compose the migration policy indexes MPI^E, MPI^S and MPI^I. The specification of the state-space model can be adjusted to the data, allowing us to combine continuous and binary indicators, as well as indicators whose level cannot initially be compared across countries. It also has an intuitive and easy solution for missing data that relies on the fact that the state-space model uses the temporal dimension of the data to increase the reliability of the estimates. The weights of the individual indicators and the temporal dimension is chosen such that it matches whatever pattern is present in the underlying indicators. Moreover, the estimation will return the entire distribution of the policy indexes at each point in time. This enables us to correctly take the underlying uncertainty into account when comparing the indexes over time or over countries and when using them in further regressions.

2.2.1 The state-space model

This section outlines the state-space model that is used to construct the migration policy indexes, focussing on the entry policy index MPI^E. The stay and integration subindexes MPI^S and MPI^I are then computed in the same way. The comprehensive index of migration policy is subsequently computed as the simple average of these three indexes, i.e. $MPI^C = \frac{1}{3}\left(MPI^E + MPI^S + MPI^I\right)$, in order to guarantee that the entry, stay and integration policy components are equally weighted.[7]

The standard state-space model is defined by a measurement equation (1) and a state equation (5). The measurement equation captures the idea that each indicator of entry policy y^κ is related to an unknown level of openness of entry policy MPI^E. However, in doing so, they make a certain measurement error (ϵ^κ), whose variance (H^κ) can differ across indicators. Similarly, the scaling parameters c^κ and z^κ are allowed to vary across indicators.[8] The measurement equation can be written as:

$$y^\kappa_{i,t} = c^\kappa + z^\kappa * MPI^E_{i,t} + \epsilon_{i,t}. \tag{1}$$

where $\epsilon^\kappa_{i,t} \sim N(0, H^\kappa)$ and subscripts i and t refer to the country and year, respectively.

By changing the measurement equation of some of the variables, we can adjust the model to deal with indicators whose level cannot be compared across countries. For these indicators, the constant c^κ_i is allowed to differ across countries, thereby capturing the fact that the initial policy level was unknown.

[7] When MPI^C is constructed based on the state-space model using all indicators, the comprehensive index ends up being very similar to the component with the highest data availability, i.e. the integration policy index.

[8] Cross-correlation between the error terms of different indicators is ruled out: $E(\epsilon^{k_1\prime}\epsilon^{k_2}) = 0$.

In this case the measurement equation becomes:

$$y_{i,t}^{\kappa} = c_i^{\kappa} + z^{\kappa} * MPI_{i,t}^{E} + \epsilon_{i,t}. \tag{2}$$

We can also modify the measurement equation to deal with the dichotomous nature of some variables. To this end, we augment the model using a continuous latent variable $y^{\star}$ in the style of a logit or probit model which gives:

$$y_{i,t}^{\star} = c^{\kappa} + z^{\kappa} * MPI_{i,t}^{E} + \epsilon_{i,t} \tag{3}$$

$$y_{i,t}^{\kappa} = \begin{cases} 0 & \text{if } y_{i,t}^{\star} \leq 0 \\ 1 & \text{otherwise.} \end{cases} \tag{4}$$

The state equation, on the other hand, captures the fact that migration policy by definition has a unit root: unless some government action is taken to change it, policy today is the same as that of yesterday.[9] To that end, this equation consists of two components: the lagged migration policy index and a term capturing the yearly change in policy, $\mu_{i,t}$. The latter is assumed to be normally distributed with mean zero and its standard deviation is set to one to ensure that the model is identified. The underlying assumption is that the current restrictiveness or openness of migration policy does not tell us how it will change over time. Rather, the only indication of change in migration policy will come from the measurement equation and the indicators collected in $y_{i,t}^{\kappa}$.

$$MPI_{i,t}^{E} = MPI_{i,t-1}^{E} + \mu_{i,t}. \tag{5}$$

The state equation is used to predict the current level of openness, using the future and past level of openness. This prediction is then updated using the indicators collected, as described in the measurement equation. The more reliable an indicator is (the smaller H^{κ}), the stronger the effect of this updating step on the final estimate.

Before the model can be run, missing observations are replaced by random and meaningless noise: if $y_{i,t}^{\kappa}$ is missing, it is set to zero while the variance of its error term $H_{i,t}^{\kappa}$ is set to infinity. As a result, the state-space model will ignore the information in these observations since they come from a source whose measurement error is infinitely large. Nevertheless, the information is no longer missing allowing the model to be run. Given that MPI^{E} depends on its previous values, the information in preceding and future observations will be used to impute the level of entry policy at time t. This will be done within the model, removing the need to impute or manipulate the data ex ante in some other way.

In contrast to the correlation over time, the model does not take the potential spatial correlation of migration policy into account. Nonetheless, it is important to note that this does not rule out that

[9] We also estimated a version of the model where the level of time dependence was allowed to vary for each country ($MPI_{i,t}^{E} = T_i * MPI_{i,t}^{E} + \mu_{i,t}$) but this did not significantly alter the resulting index values.

the index will show evidence of spatial correlation. Because the values of the indexes are drawn for one country at a time, cross-sectional independence is never imposed on the data. If the underlying indicators show evidence of spatial correlation this will be reflected in the indexes. This information is simply not used in the estimations, as this would require us to impose a specific spatial correlation structure on the data.

2.2.2 Estimation using a Bayesian Gibbs sampler

The state-space models of the migration policy indexes were estimated on the sample of 38 countries that include (at least one) indicator that tracks the *level* of restrictiveness, leaving aside the 157 countries that only cover the *change* in migration policy. Restricting the estimation sample in this way allows us to better compare the characteristics of the different indicators of migration policy (i.e. the scaling parameters c^{κ}, c_i^{κ}, z and variance H^{κ}). As shown in Figure 1, focussing on this sample significantly decreases the fraction of missing observations. Nonetheless, once these parameters are estimated using this subsample, the indexes can be computed for the entire world. Note however that for the 157 countries where data on the level of restrictiveness is missing, the indexes can only be used for comparisons over time.

The state-space model is estimated using a Bayesian Gibbs sampler, i.e. a Markov chain Monte Carlo (MCMC) estimator. This technique is built on the separation of complex (posterior) probabilities into much easier to solve conditional probabilities. If the values of the MPI^E index were known, the parameters of the state and measurement equations could be estimated using simple linear regressions and we could easily compute the distribution of their parameters. Similarly, if these parameters were known, we could compute and draw from the distribution of MPI^E using a simulation smoother. Iteratively drawing from these conditional distributions (while conditioning on the last drawn value), will produce draws that converge to the original unconditional distribution (Kim and Nelson, 1999).

To estimate each indicator, the Gibbs sampler is run for 100,000 iterations, of which the first 50,000 are discarded as burn-in.[10] The remaining iterations are used to compute the expected value, standard deviation and other characteristics of the migration policy indexes. The comprehensive MPI^C and its characteristics are then constructed by first normalising the indexes MPI^E, MPI^S and MPI^I such that their expected value and standard deviation over all countries and years is zero and one, respectively. Rather than taking the average of the expected values of the indexes, MPI^C is computed as the average

[10]The burn-in are the first iterations of the Gibbs sampler that are discarded to ensure that the starting value of the iterative estimation process no longer influences the results. As this is a Bayesian estimator, we also have to be explicit about the prior assumptions, but since ex-ante information on the distribution of the parameters is lacking, we use uninformative (flat) priors.

over the different iterations of each index. As a result, its standard deviation, confidence intervals and other characteristics still fully reflect the (un)certainty of the different migration policy indexes of which it is composed.

Defining $MPI_{i,t}^{E(l)}$, $MPI_{i,t}^{S(l)}$ and $MPI_{i,t}^{S(l)}$ as the normalised l^{th} iterations of the entry, stay and integration policy indexes, we can write the l^{th} iteration of the comprehensive migration policy index as

$$MPI_{i,t}^{C(l)} = \frac{1}{3}\left(MPI_{i,t}^{E(l)} + MPI_{i,t}^{S(l)} + MPI_{i,t}^{S(l)}\right). \tag{6}$$

As was the case for the subcomponents, these different iterations allow us to compute the (expected value of) MPI^C, its standard deviation and confidence interval. Moreover, the separate iterations can also be used in multiple imputation or Gibbs sampling analyses to ensure that any subsequent regressions take the (un)certainty of the migration policy indexes into account.

2.3 The Migration Policy Indexes

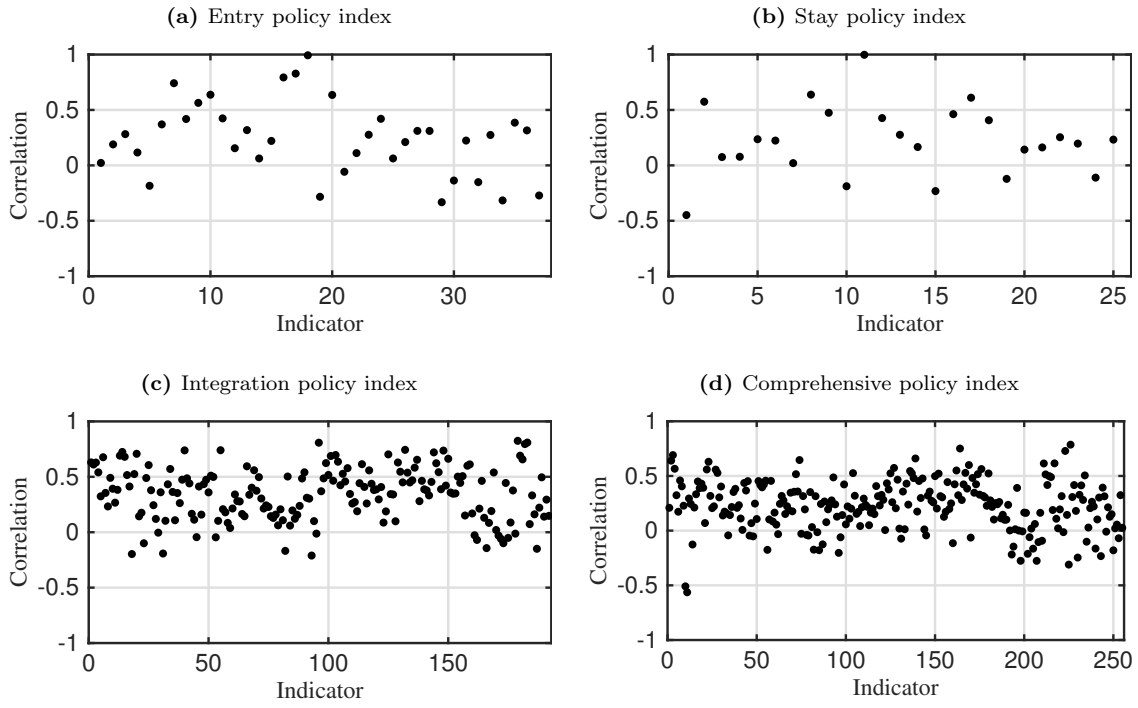
The results of the estimation procedure are the three indexes MPI^E, MPI^S and MPI^I measuring the restrictiveness of entry, stay and integration policies as well as the comprehensive indicator MPI^C which combines information on all three dimensions. All four indicators can be interpreted in the same way: an increase in the index value corresponds to an increase in the openness towards migration. These index values can be compared over time without any restrictions. However, in cross-sectional comparisons the indexes of only 38 countries can be used, as the others lack information on the (initial) level of openness.

The four indexes hide a great variability in the underlying indicators. Figure 2 illustrates this by plotting the correlation between the MPI indexes with the indicators used to create the respective index. This correlation coefficient is small for most indicators and sometimes even negative. The uncertainty is in turn reflected in the confidence bounds of the migration policy indexes which are relatively large. For instance, the (normalised) immigration entry index of the countries that can be compared cross-sectionally ranges from -6.4 to 1.1 with an average width of the confidence intervals of 1.5. As the mean of MPI^E was set to zero, its distribution is clearly skewed to the left. In contrast, the comprehensive migration index has a much more symmetrical distribution that ranges from -4.7 to 4.9. This results from the observation that the lowest entry scores are compensated by higher values on the stay and especially the integration indexes. Overall, we find that the correlation of the stay with the entry index is only 0.18, while the correlation with the integration index is negative (-0.17).

Even when the uncertainty of the indexes is taken into consideration, the indexes are informative about the countries' migration policy. By way of illustration, figure 3 plots over time the values of MPI^E and MPI^C for the US, the Netherlands, Germany and Sweden, together with their 95% confidence intervals.

For Germany and the Netherlands, we notice a significant increase in the restrictiveness of immigration entry policy since 1996, in contrast with Sweden and the US. The more comprehensive index of migration policy (MPI^C) on the other hand remains relatively constant over time, with the exception of the significant increase in openness in the case of Sweden. While initially the level of restrictiveness was more or less the same for these four countries, the different trends in their policy and shrinking confidence intervals result in significant differences for both indexes of migration policy in 2014. The contrast between the evolution of MPI^E and MPI^C for Germany and the Netherlands (and to a lesser extent Sweden) provides further evidence for the evolution towards a more restrictive entry policy which is compensated by improved integration rights over the past two decades.

Figure 2: Correlation of MPI^E, MPI^S, MPI^I and MPI^C with individual indicators

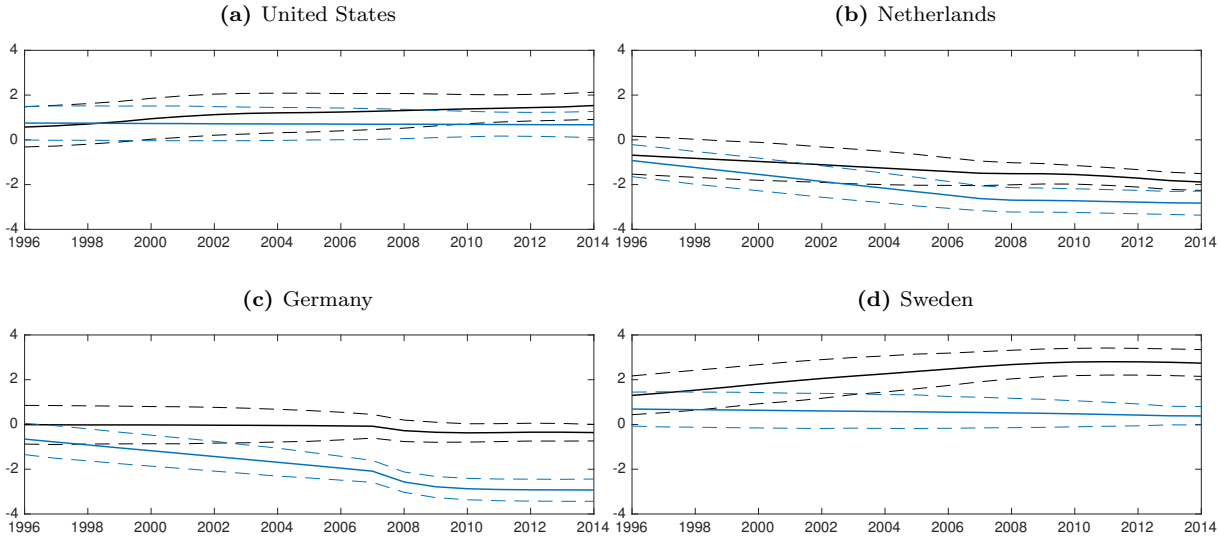


Note: Correlation of the MPI indexes with the individual indicators used to create them.

A more general characterisation of the trends in migration policy requires that the uncertainty of the estimates is dealt with in a more systematic way. As mentioned in the previous section, the different draws from the Gibbs sampler estimation procedure can be used to identify the significance of differences in the index values across countries and over time. Specifically, if in more than 95% of the draws, the MPI value of country A is larger than that of country B, we can state that country A is significantly more open with respect to that policy dimension than country B at the 5% significant level.

These significant differences allow us to construct a ranking of the countries in each year using two simple rules. Firstly, a country will have rank $x+1$ if it is significantly more open than at least one country

Figure 3: MPI^E (blue lines) and MPI^C (black lines) and their 95% confidence bounds

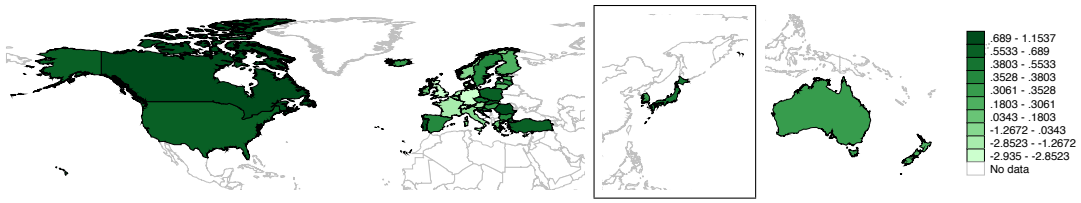


with rank x. Secondly, if a country's policy is not significantly different from that of any other country, it cannot be ranked. The advantage of constructing a ranking in this way is that small differences between countries will not lead to a different ranking unless they can be identified as statistically significant (Standaert, 2015). Figure 4 shows the results for the 38 countries whose level can be compared. Panels a and b plot the openness of MPI^E and MPI^C values in 2014. When uncertainty is taken into account, the entry (comprehensive) policy index is reduced to 5 (9) groups of countries whose level of restrictiveness is not significantly different from one another (panels c and d). In terms of both indexes, Europe is significantly more restrictive compared to North America or Australia, though the difference is much less pronounced in terms of the comprehensive migration policy index than the immigration entry policy index. In general, the different indexes lead to different country rankings, which is in line with the earlier observation from figure 3 hinting at a trade-off between entry immigration policy and integration policy and staying conditions.

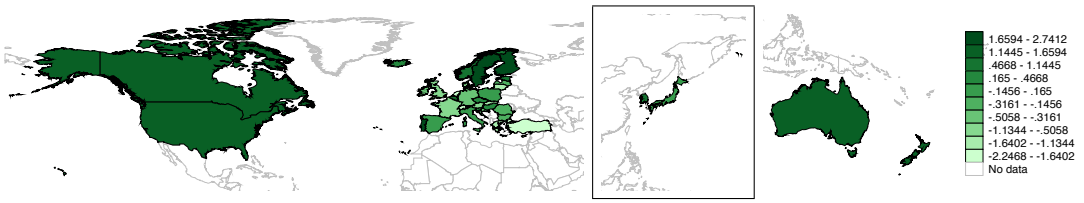
In contrast to the differences between countries, changes over time can be computed for all countries in the dataset. Panels a and b of figure 5 show the change in the MPI^E and MPI^C values between 1996 and 2014. Panels c and d depict how many of these are significant at the 10% level. Comparing significant changes and changes overall show the importance of taking the uncertainty of the estimations into account. Regarding immigration entry policy, we observe a significant increase of restrictiveness in most (Western) European countries. Given the period under consideration, i.e. that of EU enlargement to Central and Eastern Europe, it seems that a substantial number of old member states combined increased mobility within Europe with a more restrictive policy with respect to third countries. Though still present, the increase in restrictiveness is less outspoken for the comprehensive migration policy index

Figure 4: Entry and composite policy indexes in 2014: from open (dark green) to restrictive (light green)

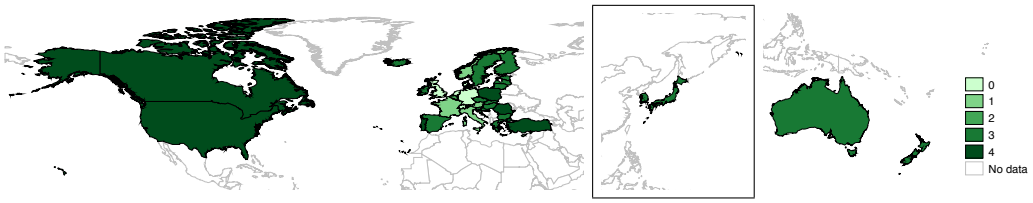
(a) MPI^E values in 2014



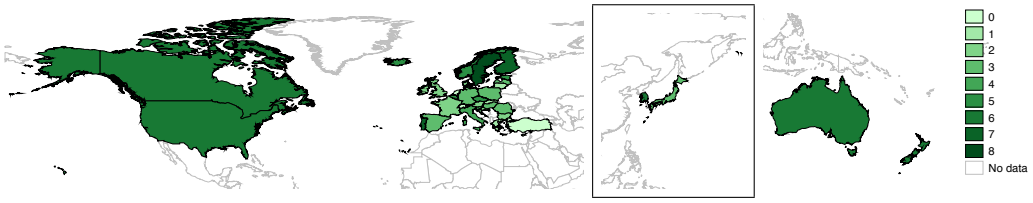
(b) MPI^C values in 2014



(c) MPI^E significant rankings in 2014



(d) MPI^C significant rankings in 2014



Notes: Plot of the values of MPI^E (a), MPI^C (b) and their significant rankings (c and d) in 2014. Two countries have a different brightness in panels c and d when their level of entry or overall migration policy is significantly different at the 5% level.

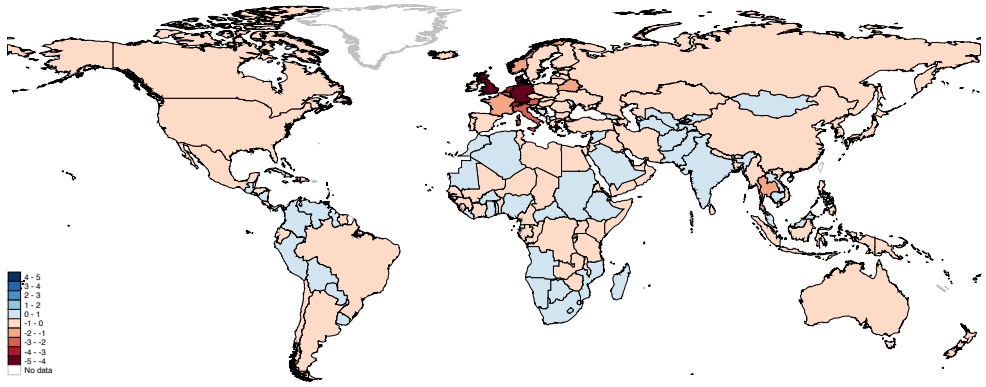
(for which Sweden and Finland show the highest increase in liberalisation). Migration policy outside Europe seems to have remained more or less unchanged in terms of restrictiveness between 1996 and 2014. The only exception is the US where the comprehensive migration policy (*but not immigration entry policy*) has become slightly but significantly more liberal.

2.4 Spatial dependence

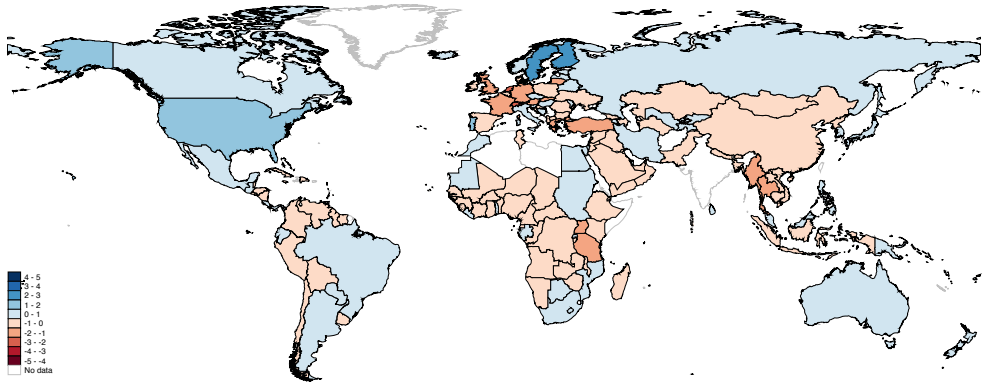
In line with earlier findings, the geographical grouping of shades in figures 4 and 5 suggests that neighbouring countries converge in the level of migration policy restrictiveness and point to cross-country correlation in migration policy determination. Migration regulations in one country seem to depend not only on local determinants, but also on the restrictiveness of migration policies in alternative destinations.

Figure 5: Changes in MPI^E and MPI^C between 1996-2014: from more open (blue) to more restrictive (red)

(a) Change in MPI^E between 1996 and 2014

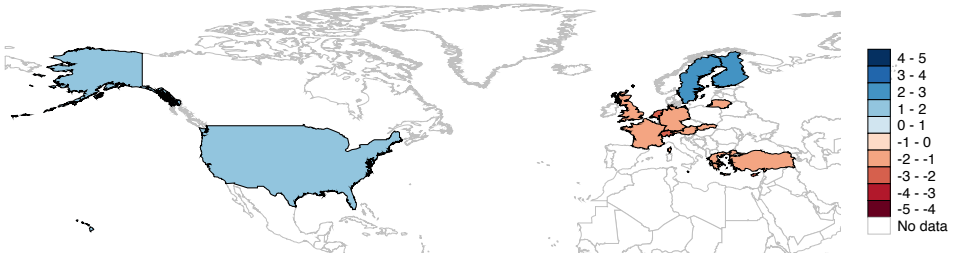


(b) Change in MPI^C between 1996 and 2014



(c) Significant changes in MPI^E between 1996 and 2014

(d) Significant changes in MPI^C between 1996 and 2014



Notes: Plot of the changes in MPI^E (a), MPI^C (b) and of the significant changes at the 10% level (c and d). Red (blue) indicates that migration policy became more restrictive (open), with the brightness indicating the size of the change.

Furthermore, spatial correlation might also stem from the increased harmonisation of migration policies, like that following the creation of the Schengen Area within the European Union.

To test for the presence of spatial dependence in our constructed indicators of migration policy MPI^E and MPI^C, we run a series of Moran's I tests. Tables 1 and 2 provide summary statistics of these Moran's I tests using either a row-normalised contiguity or inverse-distance spatial weight matrix, respectively. Specifically, we run separate Moran's I tests for each year of the converged MPI draws of the Gibbs sampler and report yearly averages and standard deviations of the Moran's I statistic in the second and third columns, as well as the percentage of those yearly draws for which the Moran's I null hypothesis of no spatial correlation can be rejected at the 10%, 5% or 1% significance level.

Table 1: Moran's I test using row-standardised contiguity weight matrix - Descriptive statistics

	MPI^E					MPI^C				
			Percentage of draws with					Percentage of draws with		
Year	Mean	Std	$p < 0.10$	$p < 0.05$	$p < 0.01$	Mean	Std	$p < 0.10$	$p < 0.05$	$p < 0.01$
1996	0.191	0.155	51.88	36.28	14.48	0.256	0.136	71.00	53.12	22.00
1997	0.209	0.150	55.88	40.76	16.20	0.272	0.129	75.12	58.24	25.00
1998	0.226	0.142	61.36	44.36	17.24	0.287	0.123	80.00	63.52	28.00
1999	0.244	0.136	67.48	50.80	19.84	0.300	0.117	83.88	68.20	32.52
2000	0.262	0.131	72.88	55.76	23.08	0.311	0.112	86.32	73.24	34.92
2001	0.278	0.124	77.24	60.56	25.16	0.324	0.107	89.16	77.60	37.88
2002	0.292	0.117	81.72	65.44	28.16	0.334	0.101	92.72	81.16	41.60
2003	0.304	0.110	85.40	70.44	31.08	0.344	0.095	95.36	85.24	44.48
2004	0.316	0.102	90.24	75.12	33.04	0.353	0.088	96.84	89.16	48.16
2005	0.329	0.093	94.08	80.16	37.80	0.364	0.080	98.60	91.88	54.20
2006	0.344	0.082	97.16	87.92	42.00	0.372	0.073	99.44	95.28	58.36
2007	0.361	0.072	99.12	94.04	49.40	0.381	0.065	99.76	97.84	65.52
2008	0.389	0.064	99.88	98.08	67.52	0.425	0.057	100.00	99.84	87.64
2009	0.404	0.058	99.92	99.52	76.96	0.440	0.054	100.00	99.96	93.12
2010	0.412	0.050	100.00	100.00	83.96	0.447	0.052	100.00	100.00	95.36
2011	0.404	0.047	100.00	99.96	81.84	0.454	0.050	100.00	100.00	97.36
2012	0.406	0.046	100.00	99.92	83.20	0.465	0.048	100.00	100.00	98.24
2013	0.419	0.045	100.00	99.92	89.60	0.500	0.045	100.00	100.00	99.92
2014	0.424	0.045	100.00	100.00	91.08	0.506	0.044	100.00	100.00	99.92

Note: *Mean* denotes the yearly mean of the Moran's I test statistics over the converged MPI draws of the Gibbs sampler using a row-normalised contiguity spatial weight matrix. *Std* reflects the yearly standard deviation of the Moran's I test statistics over the converged MPI draws of the Gibbs sampler. The last three columns reveal the share of MPI draws for which the Moran's I is statistically significant at the 10%, 5% and 1% significance levels, respectively.

The test results provide strong support for positive spatial correlation in migration policies across countries. Starting off at rather small values, the cross-country correlation in migration regulations gradually becomes stronger over the years, both in terms of size and significance. As this pattern corresponds to the changes in data availability, it is likely that larger confidence intervals hide the spatial correlation in the earlier years. The average Moran's I statistic is significant at 10% in more than half of the draws and, as of 2008, the null of no spatial correlation can be rejected in half the cases even at the 1% signifi-

Table 2: Moran's I test using row-standardised inverse-distance weight matrix - Descriptive statistics

	MPI^E					MPI^C				
			Percentage of draws with					Percentage of draws with		
Year	Mean	Std	$p < 0.10$	$p < 0.05$	$p < 0.01$	Mean	Std	$p < 0.10$	$p < 0.05$	$p < 0.01$
1996	0.036	0.039	61.00	47.40	22.84	0.026	0.040	51.12	36.56	16.60
1997	0.040	0.038	65.12	50.56	25.32	0.030	0.038	55.16	40.76	17.68
1998	0.043	0.035	69.64	55.60	27.16	0.034	0.037	59.76	45.00	18.76
1999	0.047	0.034	74.48	59.88	29.36	0.037	0.035	64.40	48.24	21.72
2000	0.050	0.033	78.24	63.36	33.12	0.041	0.034	68.08	52.88	23.20
2001	0.054	0.032	82.60	68.24	35.64	0.044	0.033	73.00	56.12	26.00
2002	0.056	0.030	86.84	72.96	39.56	0.047	0.031	76.64	60.84	28.12
2003	0.059	0.028	90.68	77.28	40.76	0.050	0.029	80.72	64.92	29.80
2004	0.062	0.025	93.28	83.00	45.44	0.052	0.027	85.40	68.20	31.76
2005	0.065	0.023	96.92	88.04	50.36	0.055	0.025	89.32	74.80	33.32
2006	0.068	0.020	98.84	92.68	55.68	0.058	0.023	93.60	80.40	37.80
2007	0.070	0.018	99.88	96.56	62.64	0.062	0.020	96.36	88.40	42.56
2008	0.077	0.016	99.96	99.52	78.64	0.066	0.018	98.48	93.32	52.40
2009	0.079	0.014	100.00	99.84	83.84	0.070	0.016	99.76	97.36	61.36
2010	0.080	0.014	100.00	100.00	87.68	0.074	0.015	99.92	99.20	72.00
2011	0.085	0.013	100.00	100.00	93.28	0.075	0.013	99.96	99.60	77.36
2012	0.094	0.013	100.00	100.00	98.76	0.079	0.013	100.00	99.80	84.48
2013	0.113	0.014	100.00	100.00	99.92	0.085	0.013	100.00	99.96	93.60
2014	0.117	0.016	100.00	100.00	99.96	0.086	0.013	100.00	100.00	95.52

Note: *Mean* denotes the yearly mean of the Moran's I test statistics over the converged MPI draws of the Gibbs sampler using a row-normalised inverse-distance spatial weight matrix. *Std* reflects the yearly standard deviation of the Moran's I test statistics over the converged MPI draws of the Gibbs sampler. The last three columns reveal the share of MPI draws for which the Moran's I is statistically significant at the 10%, 5% and 1% significance levels, respectively.

cance level for both indexes no matter the spatial weight matrix being used. Comparing the Moran's I values of MPI^E and MPI^C shows that while spatial correlation based on the comprehensive indicator is larger when using the contiguity matrix, this pattern is reversed when the inverse distance weight matrix is used.

2.5 Selectivity of migration policy

The patterns in migration policy revealed by the indices of policy restrictiveness can be complemented by adding information on the selectivity of migration policy. Selectivity refers to the circumstance where entry conditions apply differently to individuals depending on their education level or nationality. In other words, selectivity relates to restrictiveness as income distribution relates to average income. Given the multidimensionality of selectivity (e.g. in terms of eduction, occupation, or nationality) and in absence of a systematical coding of policy measures at the level of each relevant group of immigrants (whether in levels or changes), the selectivity of migration policy should be considered orthogonal to restrictiveness and measured and described independently. Ideally, we would compose an index of selectivity for each dimension.

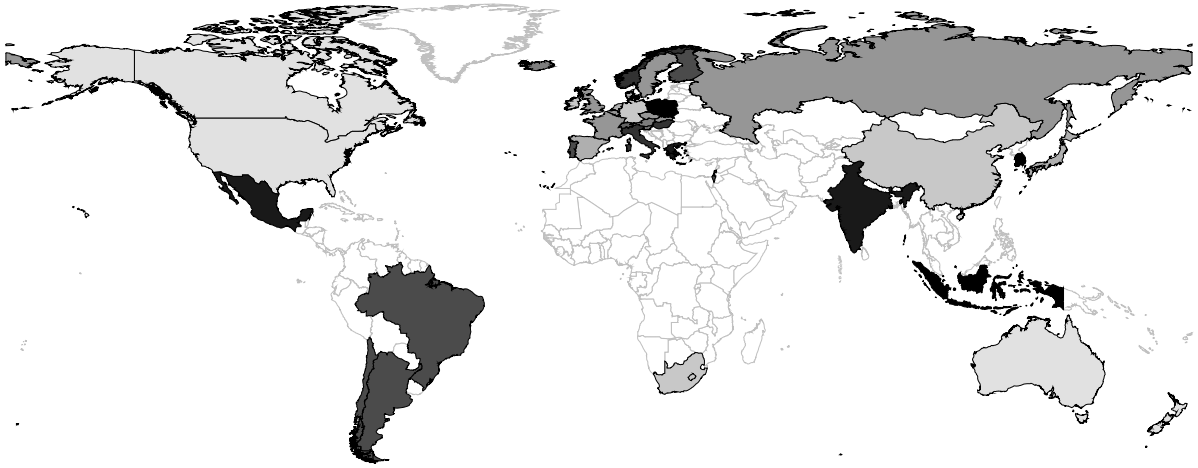
We know of only one source (the DEMIG database described above) from which we can derive information on changes in selectivity of migration policy. Unfortunately, unlike the other indicators, the DEMIG database is constructed at the level of policy measures instead of county-year pairs. Moreover, it was not constructed for the use of cross-country comparisons; using it to create a reliable cross-country measure would require a recoding at the most basic level (de Haas et al., 2015). However, as it is the only available source on selectivity, we use it to create a simple indicator that measures migration policy selectivity in terms of skill level.[11] Given its obvious methodological problems, this indicator should not be viewed as an attempt to measure selectivity that is on par with the MPI indexes capturing the restrictiveness of policy, though.

The DEMIG dataset identifies close to 400 policy measures targeting either high-skilled or low-skilled migrants, of which the vast majority deal with entry and stay requirements. We labeled these measures as selectivity-increasing when they lowered the number of low-skilled workers, raised the number of high-skilled workers, or when they raised the skill-requirements for entry. In contrast, restrictiveness increases when both the number of high and low-skilled workers decreases or skill requirements rise. The policy changes were coded negative when they raised selectivity and vice versa. They were weighted using DEMIG's assessment of the magnitude of the policy change, ranging from a fine-tuning (1) to a major policy change (4). As the DEMIG dataset claims to contain a complete list of all policy changes in the 45 countries that it covers, we created the measure of selectivity by simply computing the running total of such policy changes in each year since the end of World War II.

Restrictiveness turns out to be a bad predictor of selectivity and vice versa. The correlation between both the level and changes in these variables stands at 0.14 and -0.1, respectively, neither of which is significantly different from zero. These findings corroborate the idea that selectivity and restrictiveness are two orthogonal dimensions of migration policy. However, when plotted on a world map (figure 6), it quickly becomes clear that some of the least restrictive countries according to the MPI^C index are also the most selective, in particular Canada, New Zealand, Australia and the United States. For the most part, the more restrictive countries are less selective, but there are exceptions to this rule. Germany for example is both selective and restrictive, while Portugal is relatively open and not-selective.

[11] While the DEMIG database also contains information on the selectivity based on country of origin, combining this data into a similar country-year indicator is much harder as the impact of these measures will also depend on the relative importance of that country of origin in the group of potential migrants. A bilateral index of migration restrictiveness therefore lies outside of the scope of this paper.

Figure 6: Indicator of selectivity in 2014 (less selective = darker colour)



3 Determinants of migration policy

3.1 Median voter, interest groups and spatial correlation

Analyses based solely on social welfare considerations typically predict a much lager number of immigrants than what is actually observed. Typically, this discrepancy is explained from a political economy perspective that takes the conflicting interests of different population groups with respect to immigration into account. A general framework of the political economy model is given by Rodrik (1995) (and adopted by Facchini and Mayda, 2009), in which (migration) policy is the outcome of policy 'demand' and 'supply'. Policy demand is represented by the collective action of economic agents based on their individual preferences with respect to immigration and policy supply by the institutional structure of public policy based on politicians' preferences (e.g. in terms of their re-election). Models of immigration policy of this type predominantly deal with the 'demand side' of immigration policy, focussing on the economic and non-economic factors that determine individual attitudes towards immigration that result in collective action through various channels.

With respect to the economic factors that influence individuals' attitude towards immigration, Razin and Sadka (2000) and Facchini and Mayda (2009) distinguish between the labour market, the welfare state (redistribution) and the efficiency (immigration surplus) effects. The demand-side preferences are also shaped by non-economic considerations such as political power, cultural aversion or 'compositional amenities' (Card et al., 2012). It is unclear which of these factors will eventually dominate. Whereas Facchini and Mayda (2009), Facchini and Steinhardt (2011) and Facchini et al. (2011) point to the impact of economic factors shaping the attitudes towards immigration or decision making, Hix and Noury (2007) conclude that political determinants are more important and Card et al. (2012) find that concerns over compositional amenities significantly outweigh conventional economic concerns such as the impact on

taxes and wages.

Individual preferences with respect to immigration are channeled to policy demand by means of collective action, which is the basis of the median voter model developed by Benhabib (1996). In a straightforward setting (constant returns to scale production using labour and human or physical capital), he showed that the median voter will prefer the type of immigration that is the most complementary to her own endowments if immigration policy is determined by majority voting, but some of the implications of this model are less realistic. Razin and Sadka (2000) distinguish between social groups based on two criteria (skills and age) instead of only skills. Although more advanced median voter models have fewer radical implications, this usually comes at the expense of increasingly ambiguous conclusions with respect to the determinants of immigration policy. For instance, when Razin et al. (2009) allow for dynamic political economy considerations (following Ortega, 2005) as well as different voting strategies, they find that immigration policy reflects several dimensions that are difficult to bring back to observable characteristics of the median voter.

Moreover, from a median voter perspective, actual migration policies also seem more open than one would expect. Several explanations for this discrepancy have been offered: policy toughness could already be high in general; immigrant policies aimed at controlling economic migration flows might be inefficient; the policies might affect the composition of immigration flows rather than their level; or it might be due to lobbying activities of special interest groups. Facchini and Steinhardt (2011) propose a simplified pressure group model, with empirical evidence provided by Facchini et al. (2011). However, Milner and Tingley (2011) argue that pressure groups are more likely to influence specific measures rather than shaping overall immigration policy. They show that both economic self-interest and ideological determinants can be powerful determinants of immigration policy but that their relative importance depends upon the specific policy dimension under consideration.

Finally, supported by the preliminary Moran's I-tests presented in the previous section, we expect that a country does not determine its (immigration) policy in isolation from other (host) countries. Though the theoretical literature has not paid much attention to interdependence in migration policies, Giordani and Ruta (2013) formally show that for symmetrical countries, choosing the same level of openness as their neighbouring countries is optimal.

3.2 Empirical specification and estimation issues

To explain the restrictiveness of immigration policy, we need proxies for the characteristics of the median voter as well as for the strength or influence of interest groups. Because we also account for cross-country policy correlation, our estimations require a balanced panel structure. As a result, data availability and

the sample selection bias it may induce seriously constrain the number of empirical proxies that can be used.[12] Nevertheless, we can control for the theoretically most relevant *observable* characteristic of the median voter: i.e. her age. Specifically, we include the old age dependency ratio (as a proxy for population ageing) and public welfare expenditures related to old age (in terms of GDP).[13] The political preferences of the median voter are proxied by past migration flows as a share of the host country population.

Data availability also seriously hampers the inclusion of indicators of interest groups' efforts to influence migration policy to their benefit. Theoretically, this is represented by the financial expenditures for lobbying, but (comparable) data on lobbying are unfortunately missing for many countries. Instead, we proxy interest group activity by annual GDP growth (as an indicator of labour demand dynamics) and by labour union membership (following Facchini and Mayda, 2009). The latter acts as an indicator of organisational strength and institutional pressure of the labour movement, though its signal can be very distorted.[14] Similar to the empirical analysis of trade policy, some of these indicators might capture different determinants according to different theories (see e.g. Gawande and Krishna, 2003). GDP growth could for instance also be interpreted as an indicator of immigration surplus which is a relevant economic interest of the median voter. In addition, the median voter's voting strategy (sincere or strategic) or forward looking behaviour (the impact of immigration on future political power) remain unobserved.

Finally, we include country fixed effects as a simple and efficient way to control for unobserved heterogeneity or control variables that do not vary over time. Given the poor quality of available *annual* data, this is the most appropriate way to control for the other main characteristic of the median voter besides age, i.e. skills. This results in the following empirical specification:

$$MPI_{it} = \rho\, W\, MPI_{it} + \beta\, lnX_{it} + \alpha_i + \varepsilon_{it}, \tag{7}$$

[12] For example, to capture attitudes towards immigrants we extracted the replies to two questions from the 4th and 5th wave of the World Value Surveys. The waves span the period 1999-2004 and 2005-2009, respectively, but the construction of an annual series of attitudes towards immigrants in each country based on these data is impossible. Furthermore, we tried to approximate labour market dynamics using OECDStat employment rates (for native- and foreign-born by educational attainment) and ILO estimates of the employment to population ratio aged either 15+ or 15 to 24. Other indicators that were considered are the share of agriculture and construction in GDP (available for the period 1990-2013 but with gaps); the GINI index; and public spending on education and health in percentage of GDP, all of which are available from the World Development Indicators for the period 1960 to 2014 (with gaps). Yet, data availability for all these measures remains too poor to construct a sufficiently large panel dataset that would allow to obtain accurate estimation results.

[13] We also experimented with a measure of skill abundance of the working population calculated as the share of the population aged 25 to 34 without tertiary education, compiled from United Nations and OECD population statistics. However, the many missing values reduced the sample size to such an extent that we decided not to include it in our empirical analysis.

[14] The union membership ratio of the workforce in France, for instance, is comparable to (if not lower than) that of the US, despite substantial differences in the impact of unions on public policy. As alternative proxies for the strength of special interest groups, we also considered measures of union density and union coverage available at ILO, but their availability is limited to the periods 2001-2011 and 2002-2012, respectively.

where MPI_{it} is an indicator of migration policy openness in country i at time t (i.e. either MPI^E_{it} or MPI^C_{it}), lnX_{it} is the vector of explanatory variables in logs, α_i denotes the country fixed effects (FE), and ε_{it} is an i.i.d. error term. Spatial correlation in migration policy is assumed to have a spatial autoregressive (SAR) structure, where W denotes a row-standardised contiguity or inverse-distance weight matrix.

Data on GDP growth are taken from the World Development Indicators. Data on the old age dependency ratio, old age public expenditures, past migration flows and the union membership of wage earners are obtained from the OECD statistics. The largest possible balanced dataset includes 23 countries and 19 years.[15]

It could be argued that migration policy is trend stationary, i.e. when a country becomes temporarily less open to immigrants following e.g. a country-specific shock it will later return to the level implied by the trend so that there is no permanent decrease in openness. If this is the case, the model should be estimated in first differences. To test for this, we run two panel unit root tests developed by Maddala and Wu (1999) and Choi (2001) on the estimated residuals. The null hypothesis of a unit root is, however, always rejected, meaning that we can rely on super-consistency of the OLS estimator to produce reliable estimates for the equations in levels.[16]

3.3 Estimation results

Table 3 reports the estimation results for four specifications of the SAR model (which differ in the set of explanatory variables that is included) and this for both MPI^E and MPI^C. All specifications include a spatial lag and are estimated using a Gibbs sampler. The reported coefficients and corresponding p-values in brackets reported in the first two rows for each variable ignore the fact that MPI is an *estimated* variable. The third and fourth rows, subsequently, account for the uncertainty in the migration policy indicators by making use of the different draws of MPI^E and MPI^C. In each iteration, the Gibbs sampler draws a value from the distribution of the MPI indexes (obtained from the state-space model) which is then used to compute the distribution of the parameters of the SAR model (β and γ) to ultimately get their expected values and standard deviations.[17]

In line with expectations, we find a strong negative impact of past migration flows on the openness of entry policies, suggesting that admission procedures become tougher as more immigrants settle in the

[15] Our sample includes the following countries: Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Ireland, Italy, Japan, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Slovak Republic, Spain, Sweden, Switzerland, United Kingdom and the United States.

[16] Technically, we do not estimate our model using OLS but rely on straightforward extensions of it, i.e. the FE and SAR estimators.

[17] Using the draw of the MPI value, the distribution of β and γ parameters is computed and drawn from. These draws are saved and the next iteration is started. The converged draws can subsequently be used to compute the expected values, standard deviations and significance of the parameters.

Table 3: Determinants of migration policy - Contiguity spatial weight matrix

	MPI^E				MPI^C			
	1	2	3	4	1	2	3	4
Past migration	-0.078***	-0.092***	-0.063**	-0.132***	0.105***	0.099***	0.107***	0.070***
	(0.029)	(0.027)	(0.029)	(0.026)	(0.024)	(0.023)	(0.022)	(0.023)
	-0.086	-0.104	-0.070	-0.157**	0.121	0.113	0.124	0.081
	(0.068)	(0.067)	(0.068)	(0.067)	(0.082)	(0.082)	(0.081)	(0.079)
GDP growth	0.013***	0.006	0.008	0.010*	-0.003	-0.009**	-0.004	-0.003
	(0.006)	(0.005)	(0.006)	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)
	0.016	0.009	0.011	0.013	-0.005	-0.010	-0.006	-0.006
	(0.011)	(0.009)	(0.011)	(0.011)	(0.012)	(0.011)	(0.012)	(0.012)
Old age expenditures	0.463***		0.082	0.130	0.506***		0.416***	0.329***
	(0.140)		(0.129)	(0.125)	(0.115)		(0.103)	(0.109)
	0.496		0.047	0.078	0.462		0.349	0.257
	(0.389)		(0.367)	(0.371)	(0.438)		(0.406)	(0.412)
Dependency ratio	-2.460***	-1.690***		-1.251***	-0.597*	0.121		0.018
	(0.418)	(0.349)		(0.360)	(0.333)	(0.272)		(0.289)
	-2.825**	-1.984*		-1.342	-0.715	-0.046		-0.029
	(1.222)	(1.118)		(1.099)	(1.410)	(1.283)		(1.282)
Union membership	0.802***	0.435***	0.406***		0.418***	0.161*	0.329***	
	(0.133)	(0.101)	(0.117)		(0.103)	(0.081)	(0.089)	
	0.990***	0.574**	0.550*		0.466	0.217	0.361	
	(0.372)	(0.279)	(0.334)		(0.426)	(0.331)	(0.387)	
Spatial lag $\hat{\rho}$	0.378***	0.403***	0.416***	0.446***	0.306***	0.289***	0.315***	0.320***
	(0.037)	(0.035)	(0.035)	(0.033)	(0.045)	(0.043)	(0.046)	(0.043)
	0.244**	0.261**	0.276***	0.305***	0.096	0.086	0.102	0.109
	(0.098)	(0.096)	(0.095)	(0.093)	(0.118)	(0.119)	(0.119)	(0.120)
Maddala-Wu test stat	121.643	105.397	116.207	120.804	95.380	107.354	93.257	99.493
Maddala-Wu p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Choi test stat	7.886	5.858	7.320	7.799	5.148	6.058	4.927	5.577
Choi p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Observations	368	384	368	368	368	384	368	368

Notes: For each variable, the first two rows correspond to the SAR estimations without accounting for uncertainty in the MPI measure, while the third and fourth row report results from the SAR estimations that are robust to the uncertainty in the MPI measure. P-values between brackets. *, ** and *** indicate significance at the 10%, 5% and 1% level, respectively. To obtain the largest possible sample, the explanatory variables are lagged three periods. All explanatory variables except GDP growth are transformed to logarithms.

country. However, this effect disappears if the model is estimated using an inverse-distance weight matrix rather than the contiguity weight matrix and it is never significant in the robust regressions. The impact of past migration flows on the composite migration policy indicator, on the other hand, is positively significant in the non-robust regressions, regardless of the spatial weight matrix that is used. This seems to indicate that more immigration leads to more accommodating staying conditions and/or integration regulations for those who do get in. This is not surprising given that host countries may experience larger benefits from better integrated immigrants when this implies, for instance, easier access to work. Even so, this positive effect disappears as soon as uncertainty in the indicator of migration policy is accounted for.

The impact of GDP growth is ambiguous. When using the contiguity weight matrix, it is positive and significant in the complete model explaining entry policy, but it negative affects the comprehensive

Table 4: Determinants of migration policy - Inverse-distance spatial weight matrix

	MPI^E				MPI^C			
	1	2	3	4	1	2	3	4
Past migration	0.001	-0.008	0.017	-0.021	0.118***	0.107***	0.122***	0.071***
	(0.024)	(0.023)	(0.025)	(0.024)	(0.022)	(0.023)	(0.023)	(0.023)
	-0.026	-0.038	-0.007	-0.064	0.125	0.117	0.129	0.083
	(0.068)	(0.067)	(0.068)	(0.062)	(0.082)	(0.082)	(0.082)	(0.079)
GDP growth	0.005	0.001	0.000	0.003	-0.001	-0.006	-0.002	-0.003
	(0.005)	(0.004)	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)	(0.005)
	0.009	0.004	0.004	0.006	-0.004	-0.009	-0.006	-0.006
	(0.010)	(0.009)	(0.011)	(0.011)	(0.012)	(0.011)	(0.012)	(0.012)
Old age expenditures	0.311***		-0.109	0.121	0.422***		0.278**	0.171*
	(0.114)		(0.117)	(0.115)	(0.120)		(0.096)	(0.108)
	0.372		-0.083	0.083	0.434		0.305	0.200
	(0.382)		(0.360)	(0.361)	(0.440)		(0.406)	(0.414)
Dependency ratio	-2.598***	-2.028***		-1.927***	-0.821**	-0.173		0.033
	(0.357)	(0.310)		(0.320)	(0.327)	(0.314)		(0.329)
	-2.799**	-2.153*		-1.845	-0.797	-0.145		-0.035
	(1.251)	(1.144)		(1.141)	(1.438)	(1.303)		(1.310)
Union membership	0.450***	0.183**	0.061		0.584***	0.309***	0.468***	
	(0.111)	(0.085)	(0.109)		(0.103)	(0.083)	(0.101)	
	0.681*	0.341	0.250		0.525	0.267	0.409	
	(0.360)	(0.270)	(0.328)		(0.427)	(0.334)	(0.390)	
Spatial lag $\hat{\rho}$	0.773***	0.803***	0.788***	0.826***	0.564***	0.556***	0.570***	0.495***
	(0.040)	(0.033)	(0.040)	(0.031)	(0.075)	(0.084)	(0.079)	(0.083)
	0.560***	0.593***	0.587***	0.638***	0.154	0.148	0.151	0.142
	(0.123)	(0.118)	(0.118)	(0.104)	(0.223)	(0.227)	(0.224)	(0.224)
Maddala-Wu test stat	100.462	111.933	126.469	106.912	115.959	101.825	111.192	100.927
Maddala-Wu p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Choi test stat	5.678	6.525	8.389	6.351	7.294	5.494	6.797	5.727
Choi p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Observations	368	384	368	368	368	384	368	368

Notes: For each variable, the first two rows correspond to the SAR estimations without accounting for uncertainty in the MPI measure, while the third and fourth row report results from the SAR estimations that are robust to the uncertainty in the MPI measure. P-values between brackets. *, ** and *** indicate significance at the 10%, 5% and 1% level, respectively. To obtain the largest possible sample, the explanatory variables are lagged three periods. All explanatory variables except GDP growth are transformed to logarithms.

migration policy index. However, it is not significant using the inverse-distance weight matrix and never significant in the robust regressions. Similarly, the positive significant effect of public welfare expenditures related to old age on both policy indicators, which is in line with theoretical predictions, disappears when uncertainty in these indexes is taken into account. Population ageing as captured by the old age dependency ratio, on the other hand, appears with a significant negative sign in both the non-robust and robust estimations. Contrary to the predictions of the median voter model of e.g. Razin and Sadka (2000), we find that having an older population results in a less open migration policy (once we control for the effect of old age expenditures), although this effect is only robust for the entry immigration index.[18] Consequently, it seems that the voting behaviour of the elderly is driven less by economic considerations

[18] Boeri and Brücker (2005) report a similar finding for the EU15 countries with respect to the labour market liberalisation for citizens of the new EU member states.

- i.e. the (partial) relief immigration might provide to cope with the burden of an ageing population - but rather dominated by other motivations or cultural concerns.[19] Re-estimating the model excluding either old age expenditures (specification 2) or the old age dependency ratio (specification 3) does not significantly alter these findings.

Furthermore, in the non-robust estimations, we obtain a positive significant impact of union membership. This contradicts the prediction of the interest group approach as trade unions are expected to organise primarily those domestic workers for whom immigrant workers form the closest substitute. The significant impact is preserved in the robust estimations for entry policies but not for the composite migration policy indicator. Yet, as argued above, union membership is a rather poor proxy of the labour movement's organisational strength and institutional pressure and might hence produce misleading conjectures. Also, the influence of union strength on migration policies is expected to be negative only if immigration is low-skilled (i.e. we generally expect much less opposition against an inflow of high-skilled immigrants), which is not necessarily the case. In order to test whether the inclusion of union membership also distorts the estimated impact of the other determinants, we re-estimated the model without it. Except for the impact of the old age dependency ratio which now becomes insignificant in the robust regressions, this does not alter our main findings.

Finally, the most important finding concerns the significantly positive coefficient for the spatial lag of entry (i.e. immigration) policy. This is the case in all four specifications, in both the non-robust and robust estimations. The effect varies between 0.24 and 0.30 using a contiguity-based spatial weight matrix and between 0.56 and 0.64 based on the inverse-distance spatial weight matrix. It thus seems that changes in the restrictiveness of admission procedures in one country have direct implications for similar procedures in other countries. The fact that spatial correlation is larger based on the inverse-distance matrix might indicate that it captures a tendency towards harmonisation (like in the EU member states, though at this stage this mainly concerns common rules for family reunion and the single permit directive) or peer reference effects (the policy impact of a shock on voting preferences in a peer country).[20] The spatial autoregressive coefficient ($\hat{\rho}$) is only robustly significant for immigration entry policy (MPI^E), but not for the more comprehensive migration policy index (MPI^C), though. This can be an indication of a still substantial national margin in migration policies, in particular in the less visible policy segments such as staying conditions and integration rights. This is to some extent surprising given that many of

[19] This in line with the finding by Card et al. (2012) that compositional concerns explain more than two-thirds of the differences in -negative- opinions about immigration policy between young and older respondents, a finding that is robust across countries.

[20] To the extent that the spatial dependence is caused primarily by competition between countries, we would expect a larger spatial correlation for contiguous countries.

the host countries of immigration in our sample could be considered quite symmetrical.

4 Conclusion

In this paper, we bring together all publicly available indicators of migration policy to construct indexes capturing countries' openness of regulations in three dimensions: entry, stay and integration. These three indexes are then brought together in a comprehensive index of the restrictiveness of migration policy.

To create these indicators, we rely on a Bayesian state-space model that is able to differentiate between the individual measures in terms of their reliability. By using the time-dependence in the underlying indicators and circumventing the problem of missing observations, the state-space model can provide more stable and reliable estimates. It significantly increases data availability and coverage without imputations or other ad-hoc manipulations. Moreover, the reliability of the migration policy indicators can easily be taken into account in any subsequent computations or regressions.

The estimated migration policy indexes are then used to empirically analyse the influence of determinants taken from the major political economy hypotheses typically used to explain the restrictiveness of migration policies in the OECD as well as the impact of potential interdependence in migration policies across countries. We estimate a spatial autoregressive model using a Gibbs sampling approach to take the uncertainty in the constructed policy indexes into account. Our results provide significant indications of a positive cross-country correlation in the restrictiveness of migration policy, in particular in immigration entry policy. The sign and significance of the determinants in our estimations suggest that migration policy is rooted in a more complex framework where dynamic political economy and strategic motivations are taken into account, or in which political or cultural rather than economic arguments tend to prevail.

A natural direction for future research includes a deeper exploration of selectivity in migration policy in addition to its restrictiveness discussed in this paper. A number of entry conditions apply differently to individuals with a different level of education, and a similar level of restrictiveness can hide different levels of selectivity. Similarly, some policies are bilateral in nature. A better understanding of this selectivity both in terms of skill levels and nationality would allow a more thorough understanding of migration policy.

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A Selection of the migration policy indicators

Table 5: Selection of the migration policy indicators

Indicator	Availability	Summary
Policy change dummy (OP) (Mayda, 2010; Ortega and Peri, 2009)	22 Western countries; 1980-2006	The original dummy was created based on an extensive review of migration laws by Mayda and Patel (2004) which was later extended by Ortega and Peri (2009) by including information from the Social Reforms database (2007) from the Fondazione Rodolfo DeBenedetti. It identifies the timing and direction of policy changes (loosening vs. tightening) related to the size of immigration flows as opposed to, for example, issues of citizenship or provisions on the entry of asylum seekers. In the first year, each country's immigration policy is initialised at zero. This means that only the within-country variation over time can be used, but that the level of the index cannot be compared over countries. The authors categorised each immigration reform as decreasing, maintaining or increasing the tightness of immigration laws, which was coded as minus one, zero or plus one, respectively.
International Immigration Policies Database (IIPD) (United Nations)	193 UN members and 3 non-UN members; 1976-2013	We select six indicators that measure whether or not governments had policies in place aimed at influencing the level of migration (i.e. raise, maintain or lower the level of permanent settlement, temporary labour migration, migration for family reunification and migration of highly skilled workers), policies that foster the integration of non-nationals in the host society, or naturalisation policies.[21] They offer a reflection of the *change* in overall toughness of the policy stance, though not on its level. The first four indicators were coded 1 and 2 for policies aimed at 'lowering' and 'maintaining' the level of migration; 3 when no intervention was taken; and 4 for policies aimed at 'raising' migration inflows. The last two indicators take the value 1 when there are no such policies in place; 3 if there are; and 2 if there are but naturalisation entitlement is limited to a certain category of immigrants or where residency requirement is ten years or longer.
Migrant Integration Policy Index (MIPEX) (Niessen et al., 2007; Huddleston et al., 2015)	38 Western countries; 2007-2014	The index covers eight policy areas which define a migrant's opportunities to participate in European societies: labour market mobility, family reunion, education, health, permanent residence, political participation, access to nationality and anti-discrimination. Specifically, it provides information on 167 policy indicators, i.e. questions related to specific policy components corresponding to Council of Europe Conventions or European Community Directives. Each of them takes a value between 0 and 100 with higher values indicating higher levels of openness. All sub-indicators are retained.
Migration component of the Commitment to Development Index (CDI) (Grieco and Hamilton, 2004)	22 Western countries; 2003-2011	The CDI assesses national effort in seven policy areas including migration. This information was compiled from a variety of sources including the OECD and OECD-DAC, the World Bank, UNHCR, UNFCCC, CEPII, IEA, and other organisations, along with inputs from academic researchers. It considers migration of both skilled and especially unskilled people from developing countries, openness to students from poor countries and aid to refugees and asylum seekers. However, only one of the indicators satisfies the criteria above and is retained: the proportion of non-DAC students in all foreign students.[22]

[21] We do not consider the indicators related to emigration or those reporting government views on migration levels.

[22] The other two indicators are measured as the gross inflow of migrants from developing countries and the net increase in the number of unskilled migrant residents from developing countries, respectively. Hence, we do not consider them in

Table 5: Selection of the migration policy indicators

Indicator	Availability	Summary
Multiculturalism Policy Index (MCPI) (Queen's University)	21 Western countries; 1980, 2000 and 2010	The project provides three indexes: one for immigrant groups, one related to historic national minorities and one related to indigenous peoples. We consider only the first one which examines the extent to which governments adopted each of the following eight policies: (i) constitutional, legislative or parliamentary affirmation of multiculturalism; (ii) the adoption of multiculturalism in school curriculum; (iii) the inclusion of ethnic representation/sensitivity in the mandate of public media or media licensing; (iv) exemptions from dress-codes, Sunday-closing legislation etc; (v) allowing dual citizenship; (vi) the funding of ethnic group organisations to support cultural activities; (vii) the funding of bilingual education or mother-tongue instruction; (viii) affirmative action for disadvantaged immigrant groups. The required information is gathered from policy documents, program guidelines, legislation, government news releases and secondary sources. Each indicator is coded 0 for 'no'; 1 for 'partially'; and 2 for 'yes'.
Inventory of Migration Policies constructed by the Fondazione Rodolfo DeBenedetti (IMP) (Jacobs, 2011)	12 EU15 countries; 1990-2005.	It collects information about migration policy reforms distinguishing *changes* in migration policy along six different dimensions: the number of admission requirements, duration of the first stay, staying requirements, number of years to obtain a permanent residence permit, number of administrations involved and the existence of quotas. The six dimensions were initially expressed either in different units or in an ordinal scale specific to each item. To make the indicators comparable across countries and over time, they have been converted in cardinal scores and normalised to a range from 0 to 6, with higher score representing stricter regulation.

B List of the migration policy indicators

Table 6: List of the migration policy indicators, ordered according to their correlation with MPI^C

Indicator	Source	Type	Correlation	
			MPI^E	MPI^C
LTR language support	MIPEX	Stay		0.79
Educational guidance at all levels	MIPEX	Integration		0.75
LTR Integration form	MIPEX	Stay		0.73
The adoption of multiculturalism in school curriculum	MCPI	Integration		0.69
In-country support	MIPEX	Entry	−0.06	0.66
Law covers positive action measures	MIPEX	Integration		0.65
Affirmation of multiculturalism	MCPI	Integration		0.64
Naturalisation language courses	MIPEX	Integration		0.63
Residence period	MIPEX	Stay		0.62
Active information policy	MIPEX	Integration		0.61
Measures to address educational situation of migrant groups	MIPEX	Integration		0.60
Dependent adult children	MIPEX	Entry	0.56	0.57
Ethnic representation/sensitivity in public media	MCPI	Integration		0.57
Measures to support migrant parents and communities	MIPEX	Integration		0.56
Naturalisation language support	MIPEX	Integration		0.56
Naturalisation Integration support	MIPEX	Integration		0.56
Access to higher education	MIPEX	Integration		0.55
In-country Integration form	MIPEX	Entry	0.99	0.55
Language instruction standards	MIPEX	Integration		0.53
Naturalisation Integration courses	MIPEX	Integration		0.53
Active information policy	MIPEX	Integration		0.53

order to avoid endogeneity bias in the empirical analysis.

Table 6: List of the migration policy indicators, ordered according to their correlation with MPI^C

Indicator	Source	Type	Correlation	
			MPI^E	MPI^C
In-country exemption	MIPEX	Entry	−0.28	0.52
Minor children	MIPEX	Entry	0.74	0.52
State supported information initiatives	MIPEX	Integration		0.52
Immediate access to self employment	MIPEX	Integration		0.52
Delivery of immigrant cultures	MIPEX	Integration		0.52
Ensuring compliance of mainstream legislation	MIPEX	Integration		0.52
Public funding/support for national immigrant bodies	MIPEX	Integration		0.51
Periods of absence allowed	MIPEX	Stay		0.51
Public funding/support for immigrant bodies at local level in capital city	MIPEX	Integration		0.50
Right to autonomous residence permit for partners and children	MIPEX	Entry	0.20	0.50
Public funding/support for immigrant bodies in city ...	MIPEX	Integration		0.49
Languages	MIPEX	Integration		0.49
Option to learn immigrant languages	MIPEX	Integration		0.48
In-country cost	MIPEX	Entry	0.64	0.48
Economic resources	MIPEX	Entry	0.42	0.48
Pre-Entry Integration form	MIPEX	Entry	0.42	0.47
The funding of ethnic group organizations or activities	MCPI	Integration		0.46
Access to and supply of public goods and services, including health	MIPEX	Integration		0.46
Economic Integration measures of TCNs	MIPEX	Integration		0.45
Access to public sector	MIPEX	Integration		0.45
Employment	MIPEX	Integration		0.45
Law covers discrimination by association	MIPEX	Integration		0.45
Birth-right citizenship for second generation	MIPEX	Integration		0.45
Access to pre-primary education and compulsory education	MIPEX	Integration		0.44
Dual nationality for second/third generation	MIPEX	Integration		0.44
a. Partners	MIPEX	Entry	−0.18	0.43
Naturalisation language level	MIPEX	Integration		0.43
In-country language form	MIPEX	Entry	0.79	0.43
Option to learn immigrant cultures	MIPEX	Integration		0.42
Access to vocational training	MIPEX	Integration		0.42
Communicative/academic fluency	MIPEX	Integration		0.42
Cost/availability of interpreters	MIPEX	Integration		0.42
Access to and supply of public goods and services, including housing	MIPEX	Integration		0.42
Education	MIPEX	Integration		0.42
Public funding/support for regional immigrant bodies	MIPEX	Integration		0.42
Economic resources	MIPEX	Stay		0.42
Renewable permit	MIPEX	Stay		0.41
Access to housing	MIPEX	Integration		0.41
The funding of bilingual education or mother-tongue instruction	MCPI	Integration		0.41
Criminal record	MIPEX	Integration		0.40
Social protection	MIPEX	Integration		0.40
Policy to influence the level of documented immigration into the country	IIPD	Entry	0.22	0.39
Naturalisation language exemption	MIPEX	Integration		0.39
Regular consultation	MIPEX	Integration		0.39
Birth-right citizenship for third generation	MIPEX	Integration		0.39
Migrant pupil monitoring	MIPEX	Integration		0.38
Withdrawal grounds	MIPEX	Integration		0.38
b. Age limits	MIPEX	Entry	0.37	0.38
Law covers direct/indirect discrimination, harassment, instruction	MIPEX	Integration		0.37
Public bodies obliged to promote equality	MIPEX	Integration		0.36
Pre-Entry support	MIPEX	Entry	0.06	0.36
Grounds for rejection, withdrawal, refusal	MIPEX	Entry	0.31	0.36
Active information policy and dialogue	MIPEX	Integration		0.36
Legal protection	MIPEX	Integration		0.35
Special exemptions for asylum-seekers	MIPEX	Integration		0.35
Economic Integration measures of youth and women	MIPEX	Integration		0.35
Delivery of immigrant languages	MIPEX	Integration		0.35
Partners of nationals	MIPEX	Integration		0.33
Measures to counter segregation of migrant pupils and promote Integration	MIPEX	Integration		0.33
Duration of validity of permit	MIPEX	Stay		0.33
Residence period	MIPEX	Entry	0.19	0.33
Number of administrations involved	IMP	Entry	0.32	0.32
Exemptions from dress codes (either by statute or court cases)	MCPI	Integration		0.32
Access to self employment	MIPEX	Integration		0.32
Duration of validity of permit	MIPEX	Entry	0.31	0.32

Table 6: List of the migration policy indicators, ordered according to their correlation with MPI^C

Indicator	Source	Type	Correlation	
			MPI^E	MPI^C
Encouraging diversity in the health service workforce	MIPEX	Integration		0.32
Naturalisation Integration form	MIPEX	Integration		0.32
Range of sanctions	MIPEX	Integration		0.32
Measures to bring migrants into the teacher workforce	MIPEX	Integration		0.32
Coverage for legal migrants	MIPEX	Integration		0.32
LTR language form	MIPEX	Stay		0.32
Access to education and training	MIPEX	Entry	−0.02	0.32
Access to private sector	MIPEX	Integration		0.32
Special exemptions for undocumented migrants	MIPEX	Integration		0.31
Policy to influence the level of permanent settlement	IIPD	Entry/Stay		0.31
LTR language courses	MIPEX	Stay		0.31
Access to employment and self-employment	MIPEX	Entry	−0.13	0.30
Economic resources	MIPEX	Integration		0.30
Public employment services	MIPEX	Integration		0.30
Residence period	MIPEX	Integration		0.30
Accommodation	MIPEX	Entry	0.28	0.30
Immediate access to labour market	MIPEX	Integration		0.29
"Health in all policies" approach	MIPEX	Integration		0.29
Permit duration required	MIPEX	Entry	0.28	0.28
Recognition of academic qualifications	MIPEX	Integration		0.28
Language instruction	MIPEX	Integration		0.28
Adapting curriculum to reflect diversity	MIPEX	Integration		0.28
Methods of dissemination	MIPEX	Integration		0.28
Mandate of specialised equality body	MIPEX	Integration		0.28
Personal circumstances considered	MIPEX	Entry	−0.33	0.27
Information for service providers about migrants' entitlements	MIPEX	Integration		0.27
Legal protection	MIPEX	Stay		0.26
Right to vote in local elections	MIPEX	Integration		0.26
Dependent parents/grandparents	MIPEX	Entry	0.42	0.26
Legal protection	MIPEX	Entry	−0.14	0.26
Right to vote in national elections	MIPEX	Integration		0.25
Assessment of prior learning	MIPEX	Integration		0.25
Prohibitions in law	MIPEX	Integration		0.25
Range of legal actions	MIPEX	Integration		0.24
Recognition of professional qualifications	MIPEX	Integration		0.24
Support to access public employment services	MIPEX	Integration		0.24
Right to vote in regional elections	MIPEX	Integration		0.24
Groups	MIPEX	Integration		0.24
In-country language level	MIPEX	Entry	0.83	0.24
Groups	MIPEX	Integration		0.24
Regular consultation	MIPEX	Integration		0.24
Whole organisation approach	MIPEX	Integration		0.24
Statelenssness protections	MIPEX	Integration		0.23
Working conditions	MIPEX	Integration		0.23
Affirmative action for disadvantaged immigrant groups	MCPI	Integration		0.23
School curriculum to reflect diversity	MIPEX	Integration		0.23
Powers as quasi-judicial body	MIPEX	Integration		0.22
Naturalisation Integration cost	MIPEX	Integration		0.22
Requirement for 'culturally competent' or 'diversity-sensitive' services	MIPEX	Integration		0.22
Access to employment	MIPEX	Integration		0.22
Leadership by government	MIPEX	Integration		0.22
Adapting daily school life to reflect diversity	MIPEX	Integration		0.22
Discretionary powers in refusal	MIPEX	Integration		0.22
Support for research on migrant health	MIPEX	Integration		0.21
Policy to influence the level of family reunification	IIPD	Entry	0.27	0.21
Spouses of nationals	MIPEX	Integration		0.21
Tuition for foreign students relative to nationals.	CDI	Entry	0.02	0.21
Withdrawal time limits	MIPEX	Integration		0.21
Expulsion precluded	MIPEX	Stay		0.21
Naturalisation Integration exemption	MIPEX	Integration		0.21
Pre-Entry language form	MIPEX	Entry	0.64	0.20
Right to autonomous residence permit in case of widowhood, divorce, ...	MIPEX	Entry	−0.01	0.20
Membership in trade unions	MIPEX	Integration		0.20
Involvement of migrants in information provision, service design ...	MIPEX	Integration		0.20
Compulsory education as a legal right	MIPEX	Integration		0.20

Table 6: List of the migration policy indicators, ordered according to their correlation with MPI^C

Indicator	Source	Type	Correlation	
			MPI^E	MPI^C
Languages	MIPEX	Integration		0.19
Special exemptions for legal migrants	MIPEX	Integration		0.19
Periods of prior-absence allowed	MIPEX	Stay		0.19
Study grants	MIPEX	Integration		0.19
Legal standing in procedures	MIPEX	Integration		0.19
Costs of application	MIPEX	Stay		0.18
Powers to instigate proceedings and enforce findings	MIPEX	Integration		0.18
In-country courses	MIPEX	Entry	0.11	0.17
Costs of application	MIPEX	Integration		0.17
Allows dual citizenship (Yes, partially or no)	MCPI	Integration		0.17
Access to housing	MIPEX	Entry	0.00	0.17
Specific methods	MIPEX	Integration		0.17
Consultation representativeness	MIPEX	Integration		0.17
Protection against victimisation	MIPEX	Integration		0.16
Involvement of migrant stakeholders	MIPEX	Integration		0.16
Consultation powers	MIPEX	Integration		0.16
Regular consultation	MIPEX	Integration		0.16
Validation of skills	MIPEX	Integration		0.16
Adapting methods	MIPEX	Integration		0.15
Powers to assists victims	MIPEX	Integration		0.15
Access to social security	MIPEX	Integration		0.15
Legal provisions to allow immigrants to become naturalised citizens	IIPD	Integration		0.15
Right to association	MIPEX	Integration		0.15
LTR language exemption	MIPEX	Stay		0.14
Sanctions for reporting	MIPEX	Integration		0.14
Additional grounds for refusal	MIPEX	Integration		0.14
Good character	MIPEX	Integration		0.14
Provision of 'cultural mediators'	MIPEX	Integration		0.13
Policy on Integration of non-nationals	IIPD	Integration		0.13
Access to social benefits	MIPEX	Entry	0.04	0.13
Right to stand in local elections	MIPEX	Integration		0.11
Renunciation requirement	MIPEX	Integration		0.11
Training and education of health service staff	MIPEX	Integration		0.11
Permits considered	MIPEX	Stay		0.11
Law covers multiple discrimination	MIPEX	Integration		0.11
Shift in burden of proof in procedures	MIPEX	Integration		0.10
Access to housing	MIPEX	Integration		0.10
Teacher training to reflect diversity	MIPEX	Integration		0.10
Membership in political parties	MIPEX	Integration		0.10
Education and vocational training	MIPEX	Integration		0.10
Law accepts situation testing	MIPEX	Integration		0.08
Methods of dissemination	MIPEX	Integration		0.08
Naturalisation language cost	MIPEX	Integration		0.07
State facilitation of recognition of qualifications	MIPEX	Integration		0.07
Regular consultation	MIPEX	Integration		0.06
Methods of interpretation	MIPEX	Integration		0.06
Staying requirements	IMP	Stay		0.06
State assistance for victims	MIPEX	Integration		0.05
Involvement of stakeholders	MIPEX	Integration		0.05
Collection of data on migrant health	MIPEX	Integration		0.04
Conditions for undocumented migrants	MIPEX	Integration		0.03
Personal circumstances considered before expulsion	MIPEX	Stay		0.03
Quotas	IMP	Entry	−0.27	0.03
Time counted as pupil/student	MIPEX	Stay		0.02
Duration of the first stay	IMP	Entry	0.39	0.02
Consultation powers	MIPEX	Integration		0.02
Pre-Entry exemption	MIPEX	Entry	0.15	0.02
Pre-Entry courses	MIPEX	Entry	0.22	0.01
Consultation representativeness	MIPEX	Integration		0.01
Cost of application	MIPEX	Entry	0.06	0.01
Renunciation exemptions	MIPEX	Integration		0.01
Permits considered	MIPEX	Entry	0.12	0.01
Consultation composition	MIPEX	Integration		0.00
Consultation composition	MIPEX	Integration		0.00
Consultation powers	MIPEX	Integration		−0.01

Table 6: List of the migration policy indicators, ordered according to their correlation with MPI^C

Indicator	Source	Type	Correlation	
			MPI^E	MPI^C
Policy to influence the level of highly skilled workers	IIPD	Entry/Stay		−0.01
LTR language level	MIPEX	Stay		−0.01
Administrative discretion and documentation for legal migrants	MIPEX	Integration		−0.01
Conditions for legal migrants	MIPEX	Integration		−0.03
Role of legal entities in proceedings	MIPEX	Integration		−0.03
Conditions for asylum-seekers	MIPEX	Integration		−0.04
Maximum duration of procedure	MIPEX	Integration		−0.04
Maximum duration of procedure	MIPEX	Entry	0.21	−0.04
Coverage for asylum-seekers	MIPEX	Integration		−0.04
Law applies to natural	MIPEX	Integration		−0.05
Law applies to public sector	MIPEX	Integration		−0.05
Consultation leadership	MIPEX	Integration		−0.06
Obligation to report	MIPEX	Integration		−0.06
Teacher training to reflect migrants' learning needs	MIPEX	Integration		−0.06
Years to obtain a permanent residence permit	IMP	Stay		−0.07
Pre-Entry cost	MIPEX	Entry	0.32	−0.07
Consultation representativeness	MIPEX	Integration		−0.09
Grounds for rejection, withdrawal, refusal	MIPEX	Stay		−0.10
Consultation leadership	MIPEX	Integration		−0.10
Access to non-compulsory education	MIPEX	Integration		−0.11
Administrative discretion and documentation for undocumented migrants	MIPEX	Integration		−0.13
Periods of prior-absence allowed	MIPEX	Integration		−0.13
Consultation powers	MIPEX	Integration		−0.15
Access to social security and assistance	MIPEX	Integration		−0.16
Consultation representativeness	MIPEX	Integration		−0.16
Coverage for undocumented migrants	MIPEX	Integration		−0.17
Procedures available for victims	MIPEX	Integration		−0.18
Administrative discretion and documentation for asylum-seekers	MIPEX	Integration		−0.18
Number of admission requirements	IMP	Entry	−0.32	−0.18
Groups	MIPEX	Integration		−0.20
Consultation composition	MIPEX	Integration		−0.21
Consultation leadership	MIPEX	Integration		−0.22
Permits considered	MIPEX	Integration		−0.23
Maximum duration of procedure	MIPEX	Stay		−0.25
Consultation leadership	MIPEX	Integration		−0.28
Consultation composition	MIPEX	Integration		−0.28
LTR language cost	MIPEX	Stay		−0.31
'loosening' Entry laws	OP	Entry	−0.35	−0.51
'loosening' Stay laws	OP	Stay		−0.56

C Estimation

Estimating the state-space model requires us to find the optimal values of both the parameters of the measurement equation (c, z and H), as well as the most likely value of index itself. With the addition of binary indicators and indicators that cannot be compared over countries, the state-space model quickly becomes a very complex estimation problem. However, the Gibbs sampler estimator allows us to split this complex problem up into multiple much easier to solve subroutines. Instead of estimating the joint probability of all variables at the same time (e.g. $p(a, b)$), the Gibbs sampler works with conditional probabilities ($p(a|b)$ and $p(b|a)$). It iteratively draws b_i from $p(b|a_{i-1})$ after which a_i is drawn from $p(a|b_i)$. It can be shown that after thousands of draws, a_i and b_i will have converged to draws from the original unconditional probability $p(a, b)$. Those converged draws can then be used to reconstruct this joint probability.

In this case, the Gibbs sampler has three main blocks, each consisting of several subroutines. Using the entry subindex as example, we get the following conditional probabilities:

A. Conditioning on the values of the index $MPI^E = [MPI^E_{1,1}, ..., MPI^E_{1,n}, ..., MPI^E_{p,1}, ..., MPI^E_{p,n}]'$, the measurement equation (1) can be estimated equation by equation as a simple linear regressions.

$$p(z^\kappa, c^\kappa | MPI, y^\kappa, H^\kappa) \propto N\left(b^\kappa_{OLS}, (X'X)^{-1}H^\kappa\right) \tag{8}$$

$$p(H^\kappa | MPI, y^\kappa) \propto iWish\left(e^{\kappa\prime}e^\kappa;\ n\right) \tag{9}$$

with $X = [MPI^E, \mathbf{1}]$, $b^\kappa_{OLS} = (X'X)^{-1}(X'y^\kappa)$ and $e^\kappa = y^\kappa - c^\kappa - z^\kappa * MPI^E$.

When the migration policy indicator y^κ cannot be compared over time, the intercept c is allowed to differ for each country i. In that case, $\mathbf{1}$ is not a column vector $1_{np\times 1}$, but instead a vector of fixed effects $\mathbf{1} = 1_{n\times 1} \otimes I_p$. In the case of binary indicators, the continuous latent equivalent $y^{\kappa\star}$ should be used instead of y^κ. Moreover, in this case $H^\kappa = 1$ to ensure that the model is identified.

B. Conditional on the parameters of the state and measurement equations, the probability of the 'true' openness of migration policy can be computed and drawn from using the Carter and Kohn (1994) simulation smoother. To this end, we stack the parameters of the measurement equation into vectors: $c = [c^1, ..., c^k]'$ and $z = [z^1, ..., z^k]'$. As these steps are performed country-by-country, we temporarily drop the subscript i to simplify notation.

- *The Kalman filter*
  Starting from a wild guess, $p(MPI^E_0) = N(0, \infty)$, the following equations are iteratively solved for $t = 1$ to $t = n$:

$$\begin{aligned} MPI^E_{t|t} &= E(MPI^E_t | y_1, ..., y_t) \\ &= mpi^E_{t-1|t-1} + \kappa(y_t - c - z\ mpi_{t-1|t-1}) \end{aligned} \tag{10}$$

$$\begin{aligned} p_{t|t} &= var(MPI^E_t | y_1, ..., y_t) \\ &= p_{t|t-1} + \kappa z p_{t-1|t-1} \end{aligned} \tag{11}$$

  with $\kappa = p_{t|t-1}z'(zp_{t|t-1}z' + H)^{-1}$; and $p_{t|t-1} = p_{t-1|t-1} + 1$.

- *Simulation smoother*
  The simulation smoother algorithm is used to draw values for MPI^E. Starting from the last iteration of the Kalman filter, draw $\hat{MPI}^E{}_n$ from $N(mpi^E_{n|n};\ p_{n|n})$ and iterate backwards from $t = n - 1$ to $t = 1$:

$$\begin{aligned} mpi^E_{t|n} &= E(MPI^E_t | y_1, ..., y_n) \\ &= mpi^E_{t|t} + \varsigma(\hat{mpi}^E{}_{t+1|n} - mpi^E_{t|t}) \end{aligned} \tag{12}$$

$$\begin{aligned} p_{t|n} &= var(MPI^E_t | y_1, ..., y_n) \\ &= p_{t|t} + \varsigma(p_{t+1|n} - p'_{t|t} - 1)\varsigma' \end{aligned} \tag{13}$$

  with $\varsigma = p'_{t|t}p^{-1}_{t+1|t}$; and $\hat{mpi}^E{}_{t+1|n}$ a random draw from $N(mpi^E_{t+1|n};\ p_{t+1|n})$.

C. *The latent variable $y^\star$*
Finally, we have to draw new values for the latent variable(s) $y^{\kappa\star}$ conditional on c^κ and z^κ from step A, and MPI^E from step B. This is done by drawing from a truncated normal distribution to ensure that $y^{\kappa\star} > 0$ when $y^\kappa = 1$ and vice versa.

$$y^{\kappa\star}_{i,t} | z^\kappa, c^\kappa, MPI^E_{i,t}, y^\kappa = \begin{cases} N\left(c^\kappa + z^\kappa MPI^E_{i,t}, 1\right)\mathbf{1}_{y^{\kappa\star}>0} & \text{if } y^\kappa = 1; \\ N\left(c^\kappa + z^\kappa MPI^E_{i,t}, 1\right)\mathbf{1}_{y^{\kappa\star}\leq 0} & \text{if } y^\kappa = 0. \end{cases} \tag{14}$$

Priors

Because the state-space model is estimated in a Bayesian framework, it is necessary to specify the prior distribution of the parameters. However, since there is no prior information available on the parameters of the measurement equation, z, c and $log(H)$, flat probabilities are used for these variables. This means that all values in $\mathbb{R}$ are equally probable.

$$p(z) \propto 1_{k\times 1}; \tag{15}$$

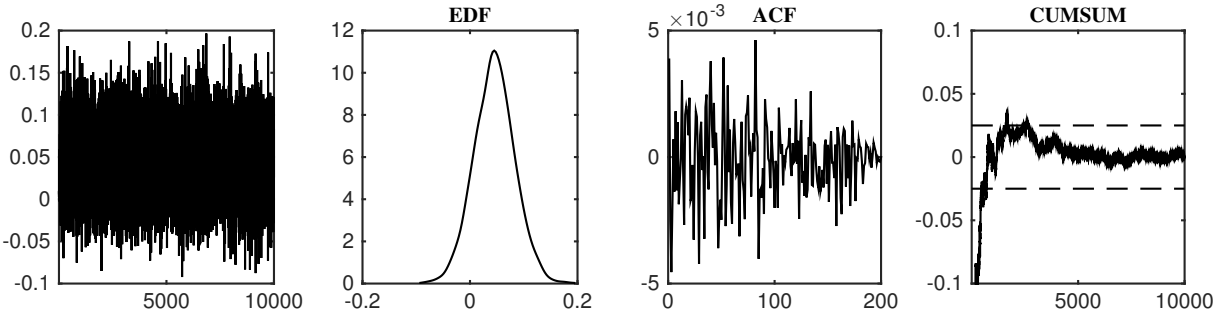
$$p(c) \propto 1_{(k\times 1)}; \tag{16}$$

$$p(\log(H)) \propto \mathbb{I}_{k\times k}. \tag{17}$$

Convergence

The Gibbs sampler algorithm ran 100,000 iterations of which the first 50,000 were discarded as burn-in. The draws of the parameters of state and measurement equation were individually examined using simple plotted values, autocorrelation functions and a rolling window CUMSUMs. Figure 7 illustrates this for the first element of z. All point to a well-behaved, converged distribution, which is what is found for the other parameters as well.

Figure 7: Convergence statistics for z^1



Top left: simple plot of all drawn values; top right: the empirical distribution function; bottom left: the autocorrelation function; and bottom right: the rolling window CUMSUM statistic, with 95% significance bounds (window: 1000 draws).

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