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ORIGINAL PAPER

Out-migration and economic cycles

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Abstract Out-migration concerns foreigners who decide to leave a country where they used to live. Taking advantage of the OECD bilateral IMS database, we analyze the short-run determinants of out-migration using a panel of Schengen countries between 1995 and 2011. We find that out-migration is counter-cyclical: foreign nationals tend to leave host countries with high unemployment, while they are likelier to stay in good times (i.e. low unemployment). Typically, a 10 % increase in the unemployment rate leads to a 5 % increase in out-migration. Thus, short-term economic fluctuations have the same qualitative effect as restrictive migration policies in economic downturns. However, we find mixed evidence for the role of economic cycles in the potential destination countries of those flows. Movers appear to be sensitive to unemployment changes in their country of origin, but they do not seem to be sensitive to business cycles in potential destinations.

Keywords Migration · Outflows · Business cycle

JEL Classifications F22 · J61 · 015

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1 Introduction

During recessions, an increase in the votes in favor of anti-immigrant parties in Western Europe becomes a recurrent fact. Citizens thus put pressure on policymakers to limit the entry of new foreigners and encourage the exit of settled migrants.

Attitudes towards migrants have become more hostile in most European countries. This can be explained by the changing nature of migration: seasonal and other temporary worker migrants have progressively been replaced by family reunification and permanent settlement since the seventies (Castles 2006). Researchers have shown that European opinions about migrants are shaped more by cultural views than by cost-benefit perceptions (Card et al. 2012). But the perception of costs might have been exacerbated during the Great Recession. Hatton (2014) shows that the change in the opinion towards immigration during this period was more negative in those countries most affected by the crisis. He finds that unemployment has a negative impact on the propensity to think that immigrants are "*good for the economy*". It may have put additional pressure on policy makers to implement measures encouraging many categories of migrants (unskilled, unemployed, but also skilled foreign students) to move back home. Among these measures, it has become increasingly difficult to renew one's residence card and migrants have been encouraged to go back home through attractive financial packages (OECD 2009).

This paper shows that an alternative policy of 'laissez-faire' might also regulate the exit of migrants (i.e. out-migration).[1] We claim in this paper that a hardening of out-migration policies might not be needed to regulate the number of settled foreigners in a country, as short-run economic forces by themselves might produce similar outcomes. More precisely, we show that settled migrants are encouraged to stay in the host country during periods of low unemployment, while they are encouraged to leave it instead in periods of high unemployment. Notice in passing that such a result weakens the idea that *"migrants are stealing the jobs of native workers in bad times"*. The paper also shows, although to a lesser extent, that the business cycle in the migrants' country of origin is also a driving force of return migration.

The literature on out-migration (return migration or migration to a third country) is relatively scarce. Borjas and Bratsberg (1996) analyze the determinant of the out-migration of foreign-born individuals in the US. They find that out-migration is negatively selected, which reinforces the positive selection over staying migration. They argue that return migration may have been planned as part of an *"optimal life-cycle residential location sequence"* or may be explained by erroneous information about opportunities in the US, received prior to deciding to migrate. More recent studies find much mixed evidence regarding the selection of outward migrants. Dustmann and Weiss (2007) put forth a model which synthesizes most of the micro-economic motives for people to go back home (return migration), and provide some

[1] Throughout the paper, we also use the terms "migration outflows" or "outward migration" when referring to out-migration.

evidence at the micro level using UK Labour Force Survey (LFS) data showing that this migration is rather selective.[2] Analyzing the migration from Eastern Europe, Mayr and Peri (2009) show that the human capital acquired in Western Europe yields higher returns in the home country, which may explain a positive selection in return migration. de Haas et al. (2015) analyze the determinants of return migration to Morocco and find very mixed results regarding whether return migration is a sign of success or failure for the migrant. Dustmann and Görlach (2014) also show that return migration is rather 'selective', as it happens to be temporary and more frequent among migrants who are nationals of rich countries than for migrants originating from developing ones. Dustmann and Görlach (2016) summarize the literature on temporary migration and show how temporariness can affect various economic choices.

Some papers address the impact of economic cycles on out-migration, but only indirectly, based on micro-data and focusing on the possible influence of employment opportunities, unemployment experience, and income dynamics at the individual level. Aydemir and Robinson (2008) show the effect of the early 1990s recession in Canada on the probability of leaving for different cohorts of migrants. They find that the probability of leaving rose rapidly the closer the cohort's entry date to this recession. However, this effect was not durable despite the persistence of high unemployment. Bijwaard and Wahba (2014) focus on the effect of income on migration duration in the Netherlands. They show that the intensities of return migration is U-shaped with respect to migrant income. Based on the same data, Bijwaard et al. (2014) find that unemployment shortens immigration duration, while re-employment delays returns. Bellemare (2007) and Constant and Massey (2003) also find a negative selection in terms of employment outcomes in return migration from Germany. Also concerning Germany, Kırdar (2009) shows that immigrants who have been unemployed for less than 3 years are more likely to return, but that long-term unemployed immigrants are more likely to stay.

Another strand of the literature looks, however, at short-run business cycle determinants of emigration or immigration. In particular, Beine et al. (2013) use bilateral migration data to show that it is driven by relative differences in business cycles or employment prospects, along with some long-run determinants (wage differences). Docquier et al. (2014) find that economic growth in destination countries is the main economic generator of economic opportunities. These results appear to be relatively consistent with other prior studies that were generally based on one country at a time (Coulombe 2006; Bertoli et al. 2013; McKenzie et al. 2014).

Our paper departs from the rest of the literature by studying the link between short-run macroeconomic factors and out-migration specifically. To some extent, our work is relatively close to that of Beine et al. (2013). However, they focus on *all* migrants from one country to another, thus using data which includes and probably represents mainly natives. Their work cannot tell specifically how *non-native* residents (whom we refer to as out-migrants in our study) behave when faced with economic shocks. As mentioned above, this neglected issue is very important with

[2] See also Dustmann et al. (2011).

regard to policy, as policymakers in some host countries would be interested in knowing how foreigners *per se* behave when faced with a shock, as this would enable them to adjust their exit-policies accordingly.

We use out-migration data from the OECD IMS database. The data have a bilateral dimension as they represent the OECD host countries' declarations of out-migrations by nationality of origin. OECD Data on migration outflows have been overlooked so far because of the heterogeneity of the country sources registering these flows. To account for this caveat, we rely systematically on *within*-reporting-country variations. Now, one expects migration flows to usually be driven by three types of factors: short-run factors, long-run determinants, and policy factors. Since we aim in particular to measure the effects of short-run factors on out-migration, we concentrate on Schengen and EU countries. By doing so, we select a dataset of countries where long-run factors (differences in wages, benefits, cultural differences, etc...) should not play a major role and where the movement of people is free from binding policy measures.

We show in particular that out-migration is counter-cyclical in the case of the host country: more precisely, a 10-%-point increase in unemployment in some resident countries appears to increase outflows by around 5.5 % points. Since this result holds within the Schengen area where no barriers are set against the movement of EU citizens, it cannot be due to a hardening of migration policies. It arises from the migrant's willingness to exit a country in a crisis. Furthermore, to the extent that out-migration is also representative of return migration, we find it to be pro-cyclical for the country of origin: low unemployment at home encourages nationals residing in foreign countries to move back home.

In Sect. 2, we describe the data. Section 3 presents some stylized facts and the empirical strategy used. The results are detailed in Sect. 4. Section 5 concludes.

2 Data and descriptive statistics

2.1 Migration outflows

We use the *International Migration Statistics* (OECD 2013) database to study the relation between out-migration and the business cycle. Data on migration outflows is provided by nationality of migrants and country of residence. It is available for 24 residence countries and 167 origin countries between 1990 and 2011. For each year, we know how many migrants from a given nationality left one given host country. It should be noted that these outflows account for all exit flows. This concerns return migration (e.g. migration back to one's country of origin), as well as all migration flows toward third countries.[3] The first sub-section describes the data and its limitations before proposing to exploit within variations. The second sub-section explains our focus on Schengen countries in order to correctly assess the impact of cyclical effects on out-migration.

[3] Return migration cannot be disentangled from migration towards a third country, as the data does not provide information about the new country of residence of the outward migrant.

2.1.1 A focus on within variations

The data are provided by a continuous reporting system on migration implemented by the OECD secretariat with the approval of member country authorities. Depending on the country, the data are obtained from three major sources: population registers, residence and/or work permit information delivered by the competent authorities, or estimations from specific surveys. In population registers, emigrants are "*usually identified by a stated intention to leave the country, although the period of (intended) absence is not always specified*." (OECD 2013, p. 314). As for survey-related data, some countries like Ireland use household surveys, while others like the UK collect data from surveys of passengers entering or exiting the country by plane, train, or boat. Due to the heterogeneity of the sources, the comparability of these statistics across countries is not guaranteed. As an illustration, Table 1 describes our sample of countries, as well as the time coverage through descriptive statistics. Outflows are reported by country of residence. In order to have a clearer idea about the *magnitude* of such outflows, we also report their ratio to the total stock of migrants in the country, as well as the native population. Migration outflows appear to represent between 2 and 10 % of total migrants for most countries, and between 0.1 and 0.8 % of the total native population. However, some countries like Italy or Estonia have much lower figures than the average.

As a result, in what follows, we will only rely on *within*-country variations, by exploiting the temporal dimension of the database. We will thus present regressions in which we systematically include reporting countries' fixed effects (that is, residence countries' fixed effects) or, alternatively, dyadic fixed effects [i.e (residence) $\times$ (origin) effects]. By exploiting the information provided in the statistical appendices of the OECD migration outlooks, we also exclude countries which have changed their data collection methodology or their definition of migrants.

Taking fixed effects into account allows to capture permanent cross-country differences in the quality of reporting outflows. However, the quality of reporting might also change over time, and not necessarily at the same rate for all our countries. We thus had to find a way to further assess the reliability of outflows per reported country over time. One ad-hoc but useful way to proceed is to look at the co-variation between the changes in migrant outflows and inflows for a reporting country, where the inflow data are known to be much more reliable than outflow data. Although the sign of the co-variation between the two measures is not obvious, there is one factor, however, which should drive the positive correlation: the fact that a higher number of out-migrants at a time t can, ceteris paribus, be driven by a higher stock of migrants in t (due to an increase in the number of incoming migrants the previous years). Nevertheless, some economic cycle determinants might drive both measures in the opposite direction: in some countries, higher unemployment might increase out-migration, while decreasing in-migration. In either case, the two measures should co-vary positively (more likely in normal times), or negatively (likely to be the case in bad times). This should lead to simultaneous cross-time changes in the flows of in-migration and out-migration. By comparing the changes

Table 1 Descriptive statistics of migration outflows (by country of residence) *Source*: OECD IMS database

Country	Years	Outflows (average)	Min	Max	Outflows (% tot. mig.)	Outflows (% nat. pop.)
Austria	1996–2011	53,028	44,350	75,573	6.7	0.6
Belgium	1990–2011	27,090	27,042	56,595	3.9	0.3
Denmark	1990–2011	13,937	4561	27,084	5.1	0.3
Finland	1990–2011	2516	938	4496	2.7	0.0
Germany	1990–2011	551,500	466,000	710,240	8.0	0.7
Hungary	1991–2010	3677	1928	6047	2.2	0.8
Iceland	1999–2011	2364	810	5850	13.8	0.8
Italy	1999–2011	15,494	7700	32,404	0.5	0.0
Luxembourg	1990–2011	6741	4940	8641	4.1	1.5
Netherlands	1990–2011	25,397	20,397	47,612	3.6	0.2
Norway	1990–2011	13,088	8057	22,883	6.2	0.3
Slovakia	2003–2011	2745	1080	5002	7.5	0.1
Slovenia	1998–2010	7034	1643	15,071	13.9	0.4
Spain	2002–2011	160,144	6931	335,676	3.0	0.4
Sweden	1990–2011	16,255	12,522	23,673	3.2	0.2
Switzerland	1990–2011	54,438	46,320	80,373	4.3	0.8

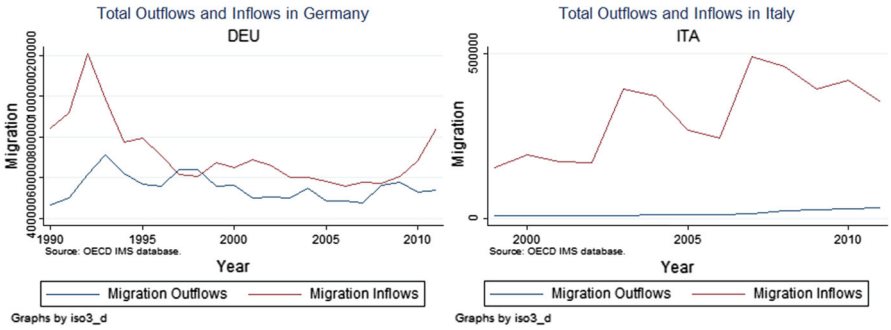


Fig. 1 Comparing migration inflows and outflows. *Note*: Reliability coding for Germany: good. reliability coding for Italy: weak *Source*: OECD IMS database

in the two flows, we were able to graphically identify some apparent connections between the two types of data for at least 9 countries out of 16. Figure 1 features two extreme representation of what we have found: one related to Germany, the other to Italy. These countries, whose figures are close to what we have for Germany, are among the most traditional host countries in the sample. Besides, they are probably those which should produce the best data on migration issues for policy reasons (besides Germany, we have Austria, Belgium, Switzerland, Denmark, Iceland, Luxembourg, Norway, and Sweden.). In "Appendix 4", we show the results of the

regressions presented in the heart of the paper, but based only on these 9 countries; the results are similar.[4]

2.1.2 The choice of Schengen countries

Besides focusing on within variations, we choose to restrict the sample to outflows of nationals from Schengen countries residing in other Schengen countries. By doing so, we keep 16 countries of residence and 24 origin countries in our database, and we focus on the 1995–2011 period.[5] In the Appendices A, B and C respectively, we modify our sample to: (a) EU nationals residing within the EU; (b) nationals from EU15 countries; and (c) the whole world sample of outflows reported by the OECD data.

The Schengen Agreements were signed in 1985 and supplemented in 1990 by the Schengen Convention which proposed the abolition of internal border controls and a common visa policy for people from third countries. The Schengen Area was created on March 26, 1995 with 7 countries (Belgium, France, Germany, Luxembourg, the Netherlands, Portugal, and Spain) and has progressively been extended since. Today, the Schengen Area includes 26 countries.

Two reasons have driven our choice of considering Schengen reporting countries and Schengen citizens first:

- *Perfect free movement of people when using the Schengen sample*
  Our main objective is to measure the impact of short-run macro determinants. However, the estimated coefficients of macroeconomic variables may be biased if the economic context induces changes in migration policies too. For instance, it may be the case if a high unemployment rate pushes a government to discourage settlements and/or encourage exits through more stringent policies. That is why we restrict our sample in our main regressions to countries between which the movement of people is free: by doing so, we can condition out the potential impact of migration policies a priori and minimize the risk of endogeneity.
  As a matter of fact, the right to move and the right of residence for all citizens is a fundamental principle of the European Union: *"All Union citizens have the right to enter another Member State by virtue of having an identity card or valid passport. Under no circumstances can an entry or exit visa be required."*
  For stays of less than three months, the only requirement is that they possess a valid identity document or passport. The right of residence for more than three months remains subject to certain conditions: either being engaged in economic activity (on an employed or self-employed basis), having sufficient resources

[4] We have also undertaken two alternative checks: first, we ran our regressions again on a sub-sample of countries where the correlation between the two is statistically significant at 5 % and found similar results than those shown in the paper. Second, we also checked the consistency of our results by dropping each country of residence, one by one, in order to be sure that our results are not driven by one single country. All these results can be provided upon request.

[5] Countries which implemented Schengen after 1995 are included in the sample only once they entered the Schengen area.

and insurance, following vocational training, or being a family member of an EU citizen who falls into one of these categories. These conditions are therefore relatively extensive. Moreover, losing one's job or no longer being self-employed is not a sufficient condition to lose the right of residence. Formally, a person retains the status of worker or self-employed person if (i) she is temporarily unable to work as a result of an illness or accident, (ii) she is duly recorded as involuntarily unemployed after having been employed for over a year, (iii) she is duly recorded as involuntarily unemployed after completing a fixed-term employment contract of less than a year, or after having become involuntarily unemployed during the first twelve months, or (iv) she enrolls in vocational training.

If a citizen does not fulfill these conditions and is caught by the authorities, she can be asked to leave the country. However, it is explicitly mentioned that the host country cannot impose a ban on entry and that the citizen keeps the right to return at any time and enjoys the right to reside (without any conditions during the first three months). Finally, the right of permanent residence in the host member state is guaranteed after a five-year period of residence and this right is no longer subject to any conditions. For all these reasons, we can reasonably assume that migration policies within the European Union are not binding for citizens from EU States.

Nevertheless, the accessing countries after the 2004 enlargement did not benefit from the same conditions: transitional restrictions were introduced for nationals of these new member states. By then, all EU countries, except the United Kingdom, Ireland, and Sweden, had imposed some restrictions. Before being abolished in May 2011, these restrictions were a serious case of binding migration policy within the EU. Furthermore, except for countries belonging to the Schengen Area, physical borders between EU countries still exist and may impede the movement of people even when they happen to be EU citizens.

That is why we propose focusing on the Schengen Area in the heart of the paper. This area does not include all EU countries. Nevertheless, it also includes non-EU members (Iceland, Norway, and Switzerland) which comply with the EU free movement rules. In the Appendices A, B and C, we show however that our main result regarding the impact of unemployment, especially in the country of residence, resists in significance and magnitude to alternative country samples (i.e. total EU, EU15, or total OECD data).

- *Short-run factors are more likely to matter for within-Schengen-area migration:* It is well known that long-run factors (differences in standards of living, benefits, cultural differences, etc...) play a significant role in shaping the movement of people across countries. A part of these factors cannot be correctly observed. Besides, some factors like living standards might even be correlated with short-run determinants of out-migration (i.e unemployment rate). Fortunately, by choosing to restrict the focus to Schengen countries, we expect that all these long-run factors will not play a major role. The corresponding countries are rather close to each other in terms of their common European culture, their standard of living, or their access to insurance schemes and other benefits.

Hence, choosing to study pairs of countries from Schengen has a direct implication: we expect the movement of people within the Schengen area to be relatively more governed by short-run rather than long-run factors rather, while excluding policy measures from our empirical equations.

2.2 Link to macro variables

In order to assess the influence of the economic context, we use three macroeconomic variables: the GDP per capita (a proxy of living standards), the growth of GDP, and the level of unemployment (i.e. short-run drivers). All variables are from the World Development Indicator. See Sect. 3.2 below for more details. As we make use of within-country variations, we focus on the possible influence of the *evolution* of such variables on the evolution of outflows. Figure 2 shows the relation between the evolution of bilateral out-migrations and the changes in our three macroeconomic variables. While we observe no clear relationship between the evolution of outflows and GDP per capita differentials (across country pairs), out-migration appears to be positively related to changes in unemployment and negatively shaped by GDP growth in the country of residence.

These simple facts regarding the role of business cycles are encouraging. They need to be validated, however, by more robust econometric regressions. But before turning to econometrics, we first present the theoretical framework of our regressions.

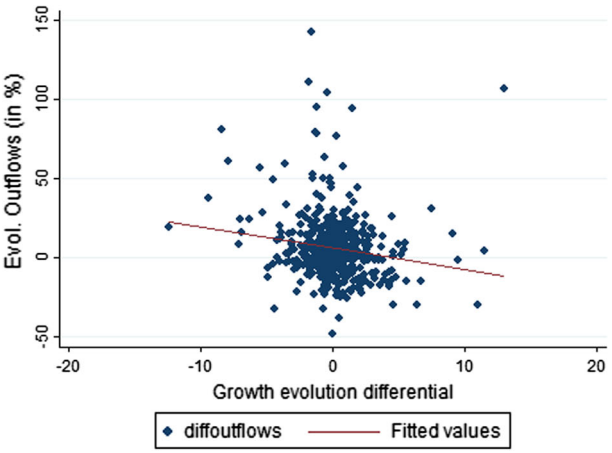
3 Theoretical framework and empirical strategy

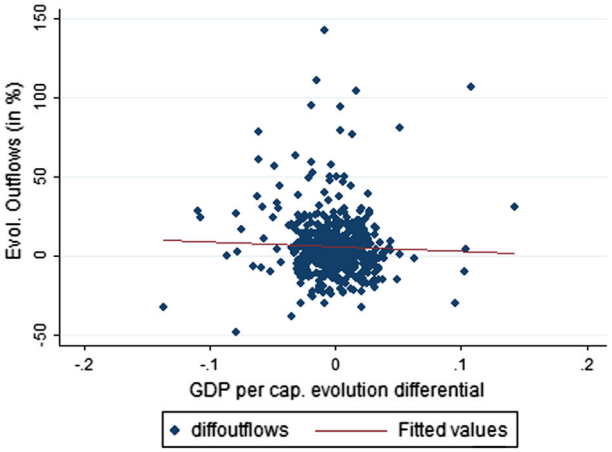
3.1 Theoretical framework

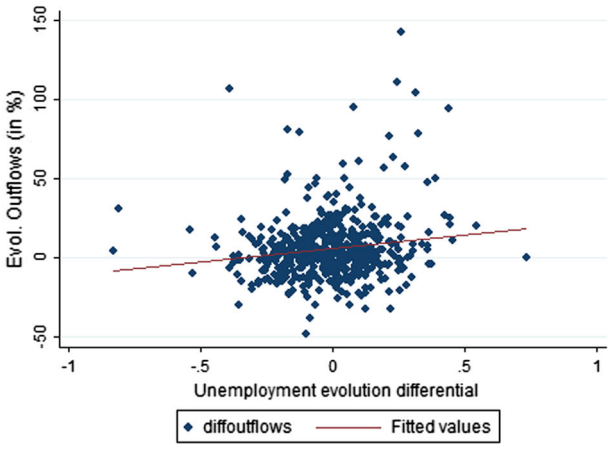
Our empirical strategy is based on the income maximization framework, which is frequently used to identify the main determinants of migration *in*flows. This approach was first introduced by Roy (1951) and Borjas (1987) and was used to analyze the role of wage differentials (Grogger and Hanson 2011), the role of diasporas (Beine et al. 2011), or the role of the "brain drain" (Gibson and McKenzie 2011). The empirical specification is thus very close to a pseudo-gravity model of international migration (Anderson 2011).

We will adapt such a framework to estimate the determinants of *out*flows instead of *in*flows. The model considers heterogeneous migrants. At each period, they have two possible choices: (1) staying in their residence country, or (2) migrating to an alternative country of residence (possibly, but not exclusively, their own country of origin). In other words, they compare the expected utility from staying to that of moving to an alternative destination, and eventually choose the one associated with the highest expected utility.

More formally, our framework is very much inspired by that of Beine et al. (2013) which we have adapted to out-migration. We note $u^{m,o,r}$ the utility of a migrant m of nationality o, residing in r. The triad index $\{m, o, r\}$ designates the identity of the migrant. This migrant might choose to stay in her current country of


Evol. Outflows (in %)
150
100
50
0
-50
-20
-10
0
10
20
Growth evolution differential
diffoutflows
Fitted values


Evol. Outflows (in %)
150
100
50
0
-50
-.2
-.1
0
.1
.2
GDP per cap. evolution differential
diffoutflows
Fitted values


Evol. Outflows (in %)
150
100
50
0
-50
-1
-.5
0
.5
1
Unemployment evolution differential
diffoutflows
Fitted values

◀**Fig. 2** Evolution of migration outflows and macroeconomic variables. *Note*: GDP per cap. evolution differential: difference of GDP per cap. between t and $t-1$. Evol. outflows: growth rate between t and $t-1$ in %. *Source*: OECD IMS database and world development indicators

residence r, or move to any alternative country in the rest of the world. Let us call that country the outside-option country, *out*. The outside option can be her own country of origin or any third country. If she decides to stay in r, her utility from living in r at time t is then given by:

$$u_{r,t}^{m,o,r} = \beta_w \ln w_{r,t} + \beta_b bc_{r,t} - \beta_u \ln ur_{r,t} + a_r - ac_{r,t}^{o} + \epsilon_{r,t}^{m,o,r} \quad (1)$$

with $w_{r,t}$ the expected wage in country r at time $t, ur_{r,t}$ the corresponding level of unemployment, and $bc_{r,t}$ a business cycle indicator. The βs represent the respective parameters to be estimated. Besides, a_r is a shifter driven by country r characteristics and, for a migrant with nationality o, $ac_{r,t}^{o}$ represents her adaption cost to the way of life in country r. This cost reflects psychological or cultural costs explained by living far from one's native country. $\epsilon_{r,t}^{m,o,r}$ is a random unobservable term that might differ across migrants (it captures migrant heterogeneity).

However, if the (m, o, r)-type migrant decides to out-migrate at time t instead, by applying the same reasoning her utility would be:

$$u_{out,t}^{m,o,r} = \beta_w \ln w_{out,t}^{o} + \beta_b bc_{out,t}^{o} - \beta_u \ln ur_{out,t}^{o} + a_{out} - dc_{out,t}^{o,r} - ac_{out,t}^{o} + \epsilon_{out,t}^{m,o,r} \quad (2)$$

where $w_{out,t}^{o}$ designates the wage the migrant would expect in the country where she chooses to live, while $bc_{out,t}^{o}$ and $ur_{out,t}^{o}$ respectively represent the business cycle variable and the unemployment rate that the migrant is expected to face in the outside-option country.

Furthermore, the cost of migrating can be divided into two parts. The first part is linked to the (direct) fixed cost of moving (cost of travel and new installation), $dc_{out,t}^{o,r}$. It is born whatever the destination of the out-migrant. $ac_{out,t}^{o}$ is the adaption costs related to the migrant's new life. Actually, adaption costs can be observed even when moving back home ($out = o$): the agent might need to (re)-adapt to life at home. However, in such a particular case, we assume that the adaption costs would be relatively small.[6] On the contrary, one would expect the adjustment costs to be relatively high if moving to a third country.

We now assume that the random terms ($\epsilon_{r,t}^{m,o,r}$ and $\epsilon_{out,t}^{m,o,r}$), follow an iid extreme-value distribution. We can therefore apply the result of McFadden (1974) to derive two probabilities: (1) the probability that a migrant from o residing in r decides to stay in r, and (2) the probability that a migrant from o residing in r decides to out-migrate. These are conditional logit-type expressions.

[6] One could also think about the 'net costs' of moving back home, where net costs correspond to the (re)adaption costs minus the satisfaction from returning to one's original habits, culture, family, and network which were left behind after the first move.

Hence, the probability of leaving the country of residence can be expressed as:

$$P(out=1) = \Pr\left[u^{m,o,r}_{out,t} > u^{m,o,r}_{r,t}\right] = \frac{\exp\left[\ln w^{o}_{out,t} + bc^{o}_{out,t} - \ln ur^{o}_{out,t} + a_{out} - dc^{o,r}_{out,t} - ac^{o}_{out,t}\right]}{\exp\left[\sum_{k\in(out,r)} \ln w_{k,t} + bc_{k,t} - \ln ur_{k,t} + a_{k} - dc_{r,k,t} - ac_{o,k,t}\right]} \quad (3)$$

The probability of staying is then its complement to unity as:

$$P(stay=1) = \Pr\left[u^{m,r}_{o,r,t} > u^{m,out}_{o,r,t}\right] = 1 - P(out=1) \quad (4)$$

We do not have access to individual migrant data, however. We then approximate the probability of moving to another country by the share of movers $(M^{o,r}_{out,t}/Mtotal^{o,r})$, where $M^{o,r}_{out,t}$ expresses the number of settled migrants in r who originate from o and choose to move to the *outside* destination during period t, and $Mtotal^{o,r}$ the total stock of o-type migrants settled in r at the *beginning* of period t. The share of stayers can then be immediately obtained through $(M^{o,r}_{r,t}/Mtotal^{o,r}) = 1 - (M^{o,r}_{out,t}/Mtotal^{o,r})$. By dividing the former by the latter share, we obtain the relative share of out-migration. This corresponds to the relative rate of movers as $\frac{M^{o,r}_{out,t}/Mtotal^{o,r}}{M^{o,r}_{r,t}/Mtotal_{o,r}} = \frac{M^{o,r}_{out,t}}{M^{o,r}_{r,t}} = \frac{P(out=1)}{1-P(out=1)}$: accounting for Eqs. 3 and 4, taking logs and rearranging, we obtain a corresponding equation in logs which will constitute the basis of our econometric tests:

$$\ln M^{o,r}_{out,t} = \ln M^{o,r}_{r,t} + \ln w^{o}_{out,t} + bc^{o}_{out,t} - \ln ur^{o}_{out,t} + a_{out} - dc^{o,r}_{out,t} - ac^{o}_{out,t} - \ln w_{r,t} - bc_{r,t} + \ln ur_{r,t} - a_{r} + ac^{o}_{r,t} \quad (5)$$

3.2 From theory to data

Recall that we only observe the number of migrants of nationality o who leave r at a given date t, but cannot observe the new destination they reach. For instance, we observe the total number of Spaniards leaving Germany, but cannot observe to which destination countries they are heading.Since we do not observe the host countries of our o-type migrants, we cannot precisely observe the variables linked to the countries chosen (like for instance $\ln w^{o}_{out}$, bc^{o}_{out} or $\ln ur^{o}_{out}$).

Starting from here, we need to approximate these unobserved variables with a series of observables.

We first assume that moving back to one's country (i.e return migration) is one of the likeliest outside options (i.e $out = o$). Then, our out-migration dependent variable $\ln M^{o,r}_{out,t}$ should be partly affected by factors which are related to the origin country o, the other part being linked to the rest of the world options where migrants may go. More formally, let $y^{o}_{out,t}$ represent one of the following variables of interest $(\ln w^{o}_{out,t}, bc^{o}_{out,t}, \ln ur^{o}_{out,t})$. $\forall y^{o}_{out,t}$ let us specify:

$$y^{o}_{out,t} = \alpha\, y_{o,t} + (1-\alpha) y_{RoW,t}$$

where $y_{o,t}$ and $y_{RoW,t}$ represent the value of y, respectively in the country of origin and in the rest of the world. α and $1-\alpha$ are their respective contribution to $y^{o}_{out,t}$. Note that $\alpha \in [0-1]$ interval and measures the share of out-migrants who go back home. Since $y_{RoW,t}$ varies only over time, it can easily be replaced by a time fixed effect. The time effect captures the general dynamics of the worldwide economy. It is a first way to control for third-country characteristics.

Taking the above equation into account, the reference out-migration Eq. 5 becomes:

$$\begin{aligned}\ln M^{o,r}_{out,t} = {} & \ln M^{o,r}_{r,t} + \eta_w \ln w_{o,t} + \eta_b bc_{o,t} - \eta_u \ln ur_{o,t} + a_o - dc_{r,o,t} \\ & - \beta_w \ln w_{r,t} - \beta_b bc_{r,t} + \beta_u \ln ur_{r,t} - a_r + ac_{o,r,t} + \lambda_t \end{aligned} \quad (6)$$

where $\eta_w = \alpha.\beta_w, \eta_u = \alpha.\beta_u$ and $\eta_b = \alpha.\beta_b$. Since $0 \leq \alpha \leq 1$, one should expect the η coefficients to be smaller than their β pairs. If all of the out-migrants were to go back home however, we would have $\eta_w = \beta_w, \eta_u = \beta_u$ and $\eta_b = \beta_b$. We leave it to the regressions to guide us on this point. Besides, λ_t is a time fixed effect meant to capture the changes over time of the variables of the rest of the world ($w_{RoW,t}, bc_{RoW,t}$ and $ur_{RoW,t}$).

Alternatively, and more generally, one can assume that, instead of going back home, a significant fraction of out-migrants might want to go where most of the migrants of the same nationality usually concentrate. Migrants follow their networks. This is another way of saying that the most common destinations are those where adaption costs are low enough. As already mentioned, we do not observe the destination of out-migrants, but we do observe, however, where they have settled historically. Let us consider the main destinations where each nationality settles (excluding its home country and its country of residence). This is observed through the ranking of the share of migrants of a given nationality across destinations. We can then further develop the expression of $y^{o}_{out,t}$ in order to account more explicitly for the main destinations chosen by migrants. Each y type variable can then be expressed as the weighted average of the same variable across the countries of origin, the other main destinations and the rest of the world. Hence, $\forall y^{o}_{out,t} \in \{\ln w_{out,t}, bc_{out,t}, \ln ur_{out,t}\}$ we obtain:

$$y^{o}_{out,t} = \alpha\, y_{o,t} + \alpha_m\, \overline{y}^{o}_{main,t} + \alpha_{row} y'_{RoW,t}$$

where now $\overline{y}^{o}_{main,t}$ represents the average value of each variable of interest y over the main destinations of interest. In the econometric section, we compute these variables with respect to the five most popular destinations for o-type migrants.[7] α_m is the overall share of the popular destinations in the total out-migration flows. Finally, $\alpha_{row}.y'_{RoW,t}$ represents the contribution of the rest of the world to changes in the y variable.

[7] We have alternatively computed these variables for the 3 main destinations with very similar results.

Taking this alternative into account, the reference out-migration Eq. 5 then becomes:

$$\begin{aligned}\ln M_{out,t}^{o,r} = {} & \ln M_{r,t}^{o,r} + \eta_w \ln w_{o,t} + \eta_b bc_{o,t} - \eta_u \ln ur_{o,t} + a_o - dc_{r,o,t} \\ & + \eta_{w,m} \overline{\ln w}_{main,t}^{o} + \eta_{b,m} \overline{bc}_{main,t}^{o} - \eta_{u,m} \overline{\ln ur}_{main,t}^{o} \\ & - \beta_w \ln w_{r,t} - \beta_b bc_{r,t} + \beta_u \ln ur_{r,t} - a_r + ac_{o,r,t} + \lambda_t \end{aligned} \quad (7)$$

where $\eta_{w,m} = \alpha_m.\beta_w, \eta_{u,m} = \alpha_m.\beta_u$ and $\eta_{b,m} = \alpha_m.\beta_b$. Again, since the αs could hardly reach 1, we expect the coefficients on popular destination variables, together with those on country of origin variables to be smaller, in absolute values, than those related to the country of residence.

We use data from different sources to estimate our above Eqs. 6 and 7.

- *Dependent variable* the outflows variable $M_{out,t}^{o,r}$ comes from the International Migration Statistics-IMS OECD database. The data have been already detailed in Sect. 2. To make the notations more explicit and easier to read in the empirical work that follows, we shall refer to it as $Out.Migrant_{o,r,t}$. Recall that this variable varies across three dimensions: the nationality of origin of the out-migrant o, the current country of residence r, and the time dimension t.
- *Number of staying migrants* The $M_{r,t}^{o,r}$ variable describes the total number of stayers at year t. We proxy this variable by $Mig.Stock_{o,r,t}$, the stock of foreign-born population by country of birth settled in r and reported at the end of year t, also provided by the IMS OECD database. Actually, we have checked the data sources: they report that the stock of migrants in a country at date t is registered on December 31 that year (for a few declarant countries, it is even registered at the beginning of January of $t + 1$). This end of year registration should then include all those who have decided to remain in r and exclude those who decided to move to another destination during year t.
- *Expected revenues from o, r, or alternatives* $\ln w_{o,t}, \ln w_{r,t}$ and $\overline{\ln w}_{main,t}^{o}$ are proxied by GDP per capita variables (in constant 2005$, expressed in PPP) and obtained from the World Development Indicators-WDI (World Bank dataset). They shall respectively be referred to by $\ln GDPcap_{o,t}, \ln GDPcap_{r,t}$ and $5Dest.\ln GDPcap_{o,t}$. The last measure is the logarithm of the weighted average GDP per capita for the 5 most popular destinations of migrants from country o, excluding the country of residence r, and the country of origin o.
- *Macro cycle variables* All of them are also provided by the WDI-World Bank database.

  1. $bc_{o,t}, bc_{r,t}$ and $\overline{bc}_{main,t}^{o}$ are the business cycle indexes that we approximate by the corresponding GDP growth rates, $Growth_{o,t}, Growth_{r,t}$ and $5Dest.Growth_{o,t}$.
  2. $\ln ur_{o,t}, \ln ur_{r,t}$ and $\overline{\ln ur}_{main,t}^{o}$ are the unemployment rates that correspond respectively to country o, country r, and the average rate prevalent in the 5 most popular destinations. They shall be noted $\ln Unemp_{o,t}, \ln Unemp_{r,t}$ and $5Dest.\ln Unemp_{o,t}$. The $5Dest.Growth_{o,t}$ and $5Dest.\ln Unemp_{o,t}$ measures

are weighted averages computed with exactly the same method as the average GDP per capita above. Note that the first 5 destination countries account for 83 % of total migration on average (from 37.75 to 99.5 %).

- *Transaction and adaption cost variables* $dc_{o,r,t}$ and $ac_{o,r,t}$ are proxied by including geographical distance ($\ln Dist_{o,r}$) and common language variables ($CommonLang_{.o,r}$), provided by the CEPII-distance dataset. Of course these variables do not account for time variance. However, we assume that, over time, changes in our *dc* and *ac* variables follow a time trend that should be captured by the time fixed effect in our regressions. In some alternative specifications, to check the robustness of our results, we also proxied transaction and adaption costs by including dyad effects (i.e. (origin × residence) fixed effects).
- *Country-o and country-r specific shifters* we proxy a_o and a_r respectively by origin and residence effects (noted λ_o and λ_r).

The empirical counterparts of Eqs. 6 and 7 then become:

$$\begin{aligned}\ln Out.migrants_{o,r,t} = {} & \beta_0 + \beta_1 \ln Mig.Stock_{o,r,t} + \beta_2 \ln(GDPcap_{r,t}) + \beta_3 Growth_{r,t} \\ & + \beta_4 \ln(Unemp_{r,t}) + \beta_5 \ln(GDPcap_{o,t}) \\ & + \beta_6 Growth_{o,t} + \beta_7 \ln(Unemp_{o,t}) + \beta_8 CommonLang_{.o,r} \\ & + \beta_9 \ln(Dist_{o,r}) + \lambda_t + \lambda_o + \lambda_r + \epsilon^{m,out}_{o,r,t} \end{aligned} \tag{8}$$

and alternatively

$$\begin{aligned}\ln Out.migrants_{o,r,t} = {} & \beta_0 + \beta_1 \ln Mig.Stock_{o,r,t} + \beta_2 \ln(GDPcap_{r,t}) + \beta_3 Growth_{r,t} \\ & + \beta_4 \ln(Unemp_{r,t}) + \beta_5 \ln(GDPcap_{o,t}) + \beta_6 Growth_{o,t} \\ & + \beta_7 \ln(Unemp_{o,t}) + \beta'_5 (5Dest. \ln GDPcap_{o,t} \\ & + \beta'_6 (5Dest.Growth)_{o,t} + \beta'_7 (5Dest. \ln Unemp_{o,t}) \\ & + \beta_8 CommonLang_{.o,r} + \beta_9 \ln(Dist_{o,r}) + \lambda_t + \lambda_o + \lambda_r + \epsilon^{m,out}_{o,r,t} \end{aligned} \tag{9}$$

Before presenting the results, remember that we do not observe the destination of the movers. Our theoretical set-up corrects for this and predicts that the coefficients related to the residence country should be higher in absolute values than those related to the country of origin, or those on the 5 most popular destinations. Typically, the β coefficients on the unemployment and the growth variables in the residence country should be higher than their counterparts in the country of origin, or than those related to the 5 most likely destinations. We leave it to the regressions to confirm or not these expectations.

3.3 Multilateral resistance applied to migration outflows

Multilateral resistance implies that any flow between two countries will affect other bilateral flows (Anderson and van Wincoop 2003; Anderson 2011). Recently, it has

received more attention in the literature on migration (see Bertoli and Fernandez-Huertas Moraga 2013). The literature shows that any shock taking place in a third country *m* has an impact on migration from, say, a country *r* to *d*. For instance, a boom in activity of country *m* would increase the incentive to choose country *m* over country *d* and thus, ultimately, should show up as a decrease in the flow of migration from *r* to *d*.

Here, the structure of the data we study is quite different: we observe out-migration flows to the rest of the world from people of nationality *o*, but residing so far in country *r*. Had we had data for destination *d*, we would have been able to control for a resistance term close to the one which the literature takes into account. Thus, we can only compare the utility that one *o*-out-migrant obtains when remaining in *r* and her utility when leaving it for the rest of the world (including going back to her own country *o*). The third country issue that drives the resistance term in prior studies thus becomes irrelevant in our case.

Now, as mentioned above, although we do not observe the destination country of the out-migrant, we do observe however her country of origin *o*. Our data has a bilateral dimension only in this respect. This information allows us, however, to consider and control for the fact that out-migrants from different origins might have different destination preferences: put differently, the opportunity cost of staying in *r* might be different depending on the origin of migrants. A Romanian migrant and a French migrant who reside in Spain do not have the same opportunity costs from staying in Spain. The alternative destinations of these two populations of migrants might be different, or at least might be weighted differently in their utility function. In the above subsection, we described precisely how we can develop our econometric specification to allow for differences in the distribution of preferences over destinations for migrants from different origins. We thus showed that differences in preferences across migrants from different origins should come from differences in shocks observed in their respective origin country, shocks observed across their respective main countries of destinations (the destination network effect), together with unobserved shocks (captured through origin or alternatively, (year × origin) country fixed effects).[8] We also progressively added residence effects, (residence × year) and (origin × residence) effects to account for additional heterogeneity across these dimensions.

[8] It should be noted that the usual procedures to tackle multilateral resistance cannot be implemented because the destination country is not observable; one cannot tell whether someone leaving one country of residence, say A, is returning to the origin country B or going to a third country C. Nevertheless, as one of the anonymous referees pointed out, it could be that a shock in country C still affects the decision to leave country A. By adding origin-year fixed effects however, we control at least partially for this multilateral resistance term, as a shock in a third country should not have the same impact on out-migration, across migrants from different origins. In fact, since each unobserved destination is weighted rather differently by migrants from different origins, any shock from that destination should be captured differently through the origin-time fixed effect.

In sum, the strategy we use here is, to some extent, in the spirit of that implemented by Ortega and Peri (2013)[9] and by Beine et al. (2013).[10]

4 Estimations and results

4.1 Baseline results

Table 2 shows the first results for the Schengen country sample.[11] Before analyzing the results regarding our variables of interest in detail (i.e the effects of growth and/or unemployment), we begin by briefly discussing the impact of the 'long-term' and transaction cost variables. They appear to be very consistent across the different specifications in terms of order of magnitude and statistical significance. First, as expected, everything else being equal, out-migrant flows are significantly related to the stock of migrants of same origin, residing in the same country. Second, while the common language variable appears with the expected sign and is significant at around 5–10 %, the distance between Schengen countries does not seem to affect the choice of people to move within the Schengen area. It is possible that the transaction and adaption costs from moving within Schengen are low enough for distance not to affect our outflows.[12] Third, the GDP per capita variable does not have a robust effect on outflows: namely, we find a positive effect of GDP per capita in the first estimation, but it becomes non-significant once we introduce time fixed effects. This is not surprising. One should note that, since we have restricted the sample to Schengen countries, we have drastically reduced the variability of the GDP per capita across our selected countries, which explains these results. In the "Appendix 3" of the paper, when we estimate the same specifications for all countries in the OECD dataset, we find a statistically significant impact of GDP per capita. This gives credit to our assumption that the non-significant results of GDP

[9] Their initial motivation was to capture the heterogeneity between stayers and movers.

[10] Some would be tempted alternatively to resort to the Bertoli and Fernandez-Huertas Moraga (2013) technique, using the Pesaran CCE estimator to account for the resistance term. But again, this technique would have been perfectly suitable had we had data by destination. One would then have been able to measure how changes in opportunities in third countries could produce an impact on moving from one country to another observed country. As discussed earlier however, in our case, the structure of the bilateral data is completely different from that modelled by Bertoli and Fernandez-Huertas Moraga. Hence, it is difficult to see the value added that we would get out of using this estimator. And even if one can see conceptually how to obtain some value added out of this technique using our data structure, the method cannot be implemented here: as it is also shown in Beine et al. (2013), we have an unbalanced panel (the data on countries of residence and countries of origin are not reported every year). As this method makes use of mean values for each observed year, and of dependent and independent variables to produce the estimate we need, these means cannot be compared across time as they would not be composed of the same set of country reporters and/or origin countries every year.

[11] Again, other results based on alternative samples, namely EU15 countries, the whole EU, and finally all the countries in the OECD dataset are presented in the "Appendices 1, 2 and 3".

[12] Note however that once we consider countries which are quite far or very far from each other, distance appears to matter: in the "Appendix 3" of the paper, one of the tables presents the results using all the countries and nationalities reported in the OECD dataset; it shows that there is a negative and statistically significant impact of geographical distance.

Table 2 Determinants of migration outflows (Schengen area)

Dep. var. ln(Mig. outflows)	(1)	(2)	(3)	(4)	(5)	(6)
ln(Mig. stock)	0.791***	0.794***	0.793***	1.088***	1.038***	0.883***
	(49.97)	(50.51)	(50.18)	(5.830)	(4.855)	(5.869)
Growth_r	−0.0503**		−0.0232	−0.0149	−0.0148	
	(−2.151)		(−1.110)	(−0.682)	(−0.650)	
ln(Unemp.)_r		0.692***	0.644***	0.542***	0.549***	
		(5.480)	(5.259)	(4.117)	(3.880)	
ln(GDP per ca.)_r	−0.943	0.0884	0.687	0.419	0.534	
	(−0.712)	(0.0728)	(0.600)	(0.372)	(0.444)	
Growth_o	0.00933*		0.00768	0.00366		0.00663
	(1.758)		(1.433)	(0.730)		(1.576)
ln(Unemp.)_o		−0.170**	−0.156**	−0.184***		−0.140**
		(−2.402)	(−2.173)	(−3.218)		(−2.428)
ln(GDP per ca.)_o	−0.212	−0.310	−0.484	−0.277		−0.347
	(−0.678)	(−0.902)	(−1.484)	(−0.877)		(−1.166)
Common language	0.126*	0.114*	0.116*			
	(1.940)	(1.731)	(1.764)			
ln(Dist)	−0.0467	−0.0547	−0.0568			
	(−0.957)	(−1.134)	(−1.175)			
Origin FE	Yes	Yes	Yes	No	No	No
Dest FE	Yes	Yes	Yes	No	No	No
Year FE	Yes	Yes	Yes	Yes	No	No
Bilat. FE	No	No	No	Yes	Yes	Yes
Origin/year FE	No	No	No	No	Yes	No
Residence/year FE	No	No	No	No	No	Yes
Observations	1763	1763	1763	1763	1763	1763
R-squared	0.940	0.942	0.943	0.973	0.976	0.984

Robust t-statistics in parentheses. Standards errors are clustered at residence-year level in columns (1)–(5) and at origin-year level in column (6).

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

per capita in our sample of Schengen countries are mainly explained by the relative homogeneity of these countries in terms of income.

Next, we turn to the effect of our main variables of interest, the macro-cycle variables (growth and unemployment). We begin by focusing on columns 1 and 2 of Table 2. In column (1), we proxy the short-run macroeconomic cycle effect by one unique indicator, the GDP growth rate, while in column (2), it is replaced by the logarithm of the unemployment rate. Column (1) shows a statistically significant negative impact of GDP growth in the country of residence on out-migration, and a statistically significant positive effect associated with GDP growth in the country of origin. Column (2) shows further confirmation of a significant impact of short-run variables on outflows: unemployment in origin and residence countries oppositely affects the exit of migrants: while unemployment in the residence country

encourages them to leave, unemployment in their homeland is more likely to make them stay.[13]

Column (3) is the exact mirror of Eq. 8, where both variables are considered. It is interesting to note that the impact of GDP growth (for both origin and residence countries) is not statistically significant anymore, while the significance and expected signs on the unemployment variables remain robust. This result is consistent with the idea that what really drives the exit of migrants is not growth reduction per se, but the impact it has on the employability of people in the country. It is also employability in the country of origin, not its GDP growth rate, which encourages people to exit their current country of residence. Notice in passing that the unemployment coefficient related to the country of origin is, in absolute values and size, about three times smaller than the one related to the country of residence. This suggests that the share of total outflows moving back home may be around one third, although this estimate should be taken with great caution. In column (4), we show the results of a more general specification than the one related to (3), as we replace the observed transaction cost proxies (distance and common language) by a more general bilateral effect. Again, the results are similar.

In the first estimates, unobserved factors affecting the movement of o-migrants were taken into account through origin country and time fixed effects, introduced progressively and independently in columns (1)–(4). However, out-migration might also be sensitive to unobserved factors changing across two interacting dimensions: time and country of origin. For instance, take French and Polish residents of the UK who consider leaving. Each nationality is affected by what happens in the UK and in its own homeland. Nevertheless, the French might have a different set of destination opportunities than the Polish. Put differently, nationals from these two countries might not be equally sensitive to an unobserved time-varying event that takes place somewhere in the world (see Sect. 3.3. for a discussion of multilateral resistance applied to migration outflows). Of course, when this is done, all the variables that are specific to time and origin country are removed from the regressions. The results are given in column (4) of Table 2. Here, we still observe a strong effect of unemployment in the country of residence on the level of outflows. According to these estimates, all other things held equal, a 10 % increase of unemployment leads approximately to a 5.5 % increase in out-migration. To have a better idea of the meaning of such a result on aggregate figures, 27,500 more migrants flow out of Germany after an increase in unemployment there of about 10 %.

[13] Some might flag a potential reverse causality between unemployment variables and outflows. The mechanism goes this way: people from one country exiting, if the flow of exit is sufficiently large, might reduce unemployment there. If they return home, and if the size of the corresponding flow is relatively large, they would in turn increase unemployment at home. If this is true, then our coefficients on the unemployment variables would be underestimated in absolute values. This thought is very unrealistic in our case, however, since the number of outflow migrants is extremely small compared to the unemployed in the residence countries. The maximum level of *bilateral* outflows is 38,950 (Italian outflows from Germany in 1997). Outflows higher than 10,000 represent 2.7 % of all bilateral flows only. Outflows higher than 30,000 (15 observations) are only Italian outflows from Germany for different years. Despite this skepticism concerning the risk of reverse causality, we ran additional regressions using the lagged value of unemployment. Our results are similar and can be obtained upon request.

We also perform a symmetric exercise whereby we introduce a (residence × year) effect instead of an (origin × year) effect. This is done to capture any unobserved time-varying event in the residence country that might affect exits. By doing so, all time- and residence-specific variables are now captured by the new interaction term. By looking at the results again, we still find a negative and statistically significant impact of unemployment in origin countries on out-migration flows. Namely, a higher level of unemployment in the origin country is

Table 3 Determinants of migration outflows (Schengen area)

Dep. var. ln(Mig. outflows)	(1)	(2)	(3)	(4)	(5)
ln(Mig. stock)	0.795***	0.784***	0.782***	1.084***	0.857***
	(50.65)	(46.35)	(46.04)	(6.218)	(5.072)
Growth_r	−0.0534**		−0.0202	−0.0148	
	(−2.223)		(−0.984)	(−0.701)	
ln(Unemp.)_r		0.707***	0.666***	0.546***	
		(5.677)	(5.453)	(4.173)	
ln(GDP per ca.)_r	−0.689	0.710	1.232	0.771	
	(−0.503)	(0.609)	(1.116)	(0.711)	
Growth 5 dest. countries	0.00925		0.0136	0.00684	0.00760
	(0.460)		(0.687)	(0.434)	(0.530)
ln 5 dest. countries		0.136	0.101	0.0896	0.106
		(0.600)	(0.440)	(0.531)	(0.614)
ln(GDP per ca.) 5 dest. countries −1.690	−1.992	−3.062	−1.843	−1.677	
	(−0.874)	(−1.051)	(−1.472)	(−1.152)	(−0.960)
Growth_o	0.00762		0.00901	0.00398	0.00877
	(1.264)		(1.041)	(0.549)	(1.438)
ln(Unemp.)_o		−0.158*	−0.149*	−0.187***	−0.156**
		(−1.916)	(−1.784)	(−2.735)	(−2.371)
ln(GDP per ca.)_o	−0.234	−0.0961	−0.280	−0.239	−0.375
	(−0.684)	(−0.220)	(−0.667)	(−0.651)	(−1.007)
Common language	0.137*	0.167**	0.168**		
	(1.880)	(2.167)	(2.180)		
ln(Dist)	−0.0464	−0.0636	−0.0661		
	(−0.955)	(−1.342)	(−1.414)		
Origin FE	Yes	Yes	Yes	No	No
Dest FE	Yes	Yes	Yes	No	No
Year FE	Yes	Yes	Yes	Yes	No
Bilat. FE	No	No	No	Yes	Yes
Origin/year FE	No	No	No	No	Yes
Residence/year FE	No	No	No	No	No
Observations	1622	1481	1481	1481	1481
R-squared	0.938	0.940	0.940	0.974	0.984

Robust t-statistics in parentheses. Standard errors are clustered at the residence-year level.
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

associated with a lower level of migration outflows, as incentives for return migration are lower.

We turn next to Table 3 where we test an augmented migration outflow specification, related to Eq. 9. Recall that the augmented specification now accounts for economic changes in the main countries of destination historically of o-movers. In columns (1)–(5), we reproduce the corresponding specifications shown in Table 2, while adding the variables related to the 5 main countries of migration. Two main results stand out: first, our two important results regarding the role of unemployment in the country of origin and the country of residence persist. Typically, we still find a positive and statistically significant impact of unemployment on out-migration in residence countries and a negative impact of unemployment in origin countries. Furthermore, these effects are similar in magnitude to those found in the previous table. Second, more surprisingly, we do not find any significant impact of the economic context in the 5 main countries of migration. However, we should be very cautious since this lack of significance may come from the average if the economic context in these 5 countries followed very different business cycles.

4.2 The role of networks

Networks in residence countries are likely to have a role in the decision to out-migrate. On the one hand, networks may smooth adverse economic shocks as a kind of insurance mechanism. In that case, they will reduce the impact of economic shocks on outflows. On the other hand, however, the presence in some destinations of a significant network (a big diaspora) might reduce the skill quality of migrants (McKenzie and Rapoport 2010; Beine et al. 2011; Bertoli 2010; Bertoli and Rapoport 2015) and thus increase the likelihood that migrants from that diaspora be unemployed. In this respect, one should observe an increase in the impact of unemployment on out-migration when the diaspora is sufficiently large. The relation is *a priori* ambiguous, but one could expect a non-linear effect of economic shocks on outflows, depending on the size of the diaspora. In order to test the idea, we propose interacting unemployment and economic growth with the stock of migrants in residence countries.

The empirical specification is given by Eqs. 10 and 11 and the results are given in Table 4.

$$\begin{aligned}\ln Out.migrants_{o,r,t} = {} & \beta_0 + \beta_1 \ln Mig.Stock_{o,r,t} + \beta_2 \ln(GDPcap_{r,t}) + \beta_3 Growth_{r,t} \\ & + \beta_4 \ln(Unemp_{r,t}) + \beta_5 \ln Mig.Stock_{o,r,t}.\ln(Unemp_{r,t}) \\ & + \beta_6 \ln(GDPcap_{o,t}) + \beta_7 Growth_{o,t} + \beta_8 \ln(Unemp_{o,t}) \\ & + \lambda_t + \lambda_{o,r} + \epsilon^{m,out}_{o,r,t} \end{aligned} \tag{10}$$

$$\begin{aligned}\ln Out.migrants_{o,r,t} = {} & \beta_0 + \beta_1 \ln Mig.Stock_{o,r,t} + \beta_2 \ln(GDPcap_{r,t}) + \beta_3 Growth_{r,t} \\ & + \beta_4 \ln Mig.Stock_{o,r,t}.Growth_{r,t} + \beta_5 \ln(Unemp_{r,t}) \\ & + \beta_6 \ln(GDPcap_{o,t}) + \beta_7 Growth_{o,t} + \beta_8 \ln(Unemp_{o,t}) \\ & + \lambda_t + \lambda_{o,r} + \epsilon^{m,out}_{o,r,t} \end{aligned} \tag{11}$$

Table 4 The role of networks

Dep. var. ln(Mig. outflows)	(1)	(2)	(3)	(4)
ln(Mig. stock)	0.839***	0.747***	1.085***	1.029***
	(4.832)	(3.982)	(5.862)	(4.909)
Growth_r	−0.0248	−0.0265	−0.0169	−0.0173
	(−1.356)	(−1.434)	(−0.777)	(−0.756)
ln(Mig. stock).Growth_r			−0.00424	−0.00518
			(−1.370)	(−1.321)
ln(Unemp.)_r	0.378***	0.360***	0.550***	0.559***
	(3.608)	(3.213)	(4.190)	(3.964)
ln(Mig. stock).ln(Unemp.)_r	0.145***	0.167***		
	(3.000)	(3.047)		
ln(GDP per ca.)_r	0.748	0.924	0.697	0.872
	(0.747)	(0.855)	(0.653)	(0.771)
Growth_o	0.00175		0.00251	
	(0.325)		(0.472)	
ln(GDP per ca.)_o	−0.267		−0.241	
	(−0.866)		(−0.768)	
ln(Unemp.)_o	−0.148***		−0.174***	
	(−2.678)		(−3.104)	
Year FE	Yes	No	Yes	No
Bilat. FE	Yes	Yes	Yes	Yes
Origin/year FE	No	Yes	No	Yes
Residence/year FE	No	No	No	No
Observations	1763	1763	1763	1763
R-squared	0.975	0.978	0.974	0.976

Robust t-statistics in parentheses. Standard errors are clustered at the residence-year level.
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

The interaction term in residence countries is positive, which means that the size of migrants' networks actually magnifies the effect of unemployment in residence countries on the level of outflows. The larger the diaspora, the stronger the positive effect of unemployment on outflows. Without taking the conditional effect of networks into account, the effect of unemployment on outflows is approximately 25 % lower. This result is consistent with the diaspora low-skill-of-migrants effect. However, we do not find any difference or any statistical significance when interacting the network variable with the growth variable.

4.3 Robustness checks

4.3.1 External validity

As robustness checks, we ran various additional estimates that confirmed our results. First, we changed the sample, by focusing on EU countries instead of Schengen

countries. The results were very similar to those for the influence of unemployment (see "Appendix 1"). The influence of unemployment is even stronger in magnitude (0.8). Second, we restricted the sample to the EU15, excluding new members which entered in 2004. By doing so, we obtained a more homogenous sample of countries in terms of living standards, in order to focus even more on short-term drivers. Once again, our results appeared to be similar (see "Appendix 2").

Lastly, we also produced results using all countries in the OECD dataset. The results are provided in "Appendix 3" as an illustration only: recall that the risk of endogeneity here is stronger because of the influence of migration policies. We nevertheless see that long-term drivers of migration (such as living standards) play a stronger role. The sign and significance of the unemployment effect in residence countries is not affected, though the magnitude is lower. This result may be explained by the higher sensitivity of migrants to economic cycles when there are no migration restrictions.[14] Unemployment in the origin country is no longer significant, which can be explained by the low relevance of the unemployment rate in many developing countries (where informality might be high). Bilateral transaction cost proxies (distance and language) take the expected sign and are now statistically significant.

4.3.2 Taking the heterogenous quality of the data into account

As highlighted in Sect. 2.1.1, the quality of outflow data may be challenged. By focusing on the within variation, we take into account the lack of comparability between countries which use different methodologies to measure outflows. We have also excluded countries which changed their methodology over the period. However, one cannot exclude that the within variation may also be biased. For instance, if the reporting system is very weak, the reported evolution of outflows is likely to be very flat, whatever the real level of variation. This will create a downward bias in our estimates. On the other hand, a peak in the outflow data may be the result of cleaning up the population registers. If local authorities realize that migrants are no longer living where they were registered, they will be excluded from the population register and this will be seen as an outflow, even if the migrants have been gone for a long time. If the cleaning of the population register is done when the economic cycle is low, for whatever reason, it will create an upward bias in these estimates. We provide three sets of robustness tests to check that our results persist when we focus on data which may be considered more reliable.

First, we restrict the sample to countries where the reliability of the data is stronger. We use the typology described in Sect. 2.1.1. We exclude countries where the low quality of the data may alter the quality of the estimates. Results are given in "Appendix 4" and are similar to our baseline estimates. We note also that the coefficients of GDP per capita in residence country, common

[14] This argument is very similar to Ortega and Peri (2013) on migration inflows. They find a much higher migration elasticity to income in the Schengen area than in the world sample and argue that it is explained by the lack of migration restrictions within Schengen.

language and log of distance become significant with the expected sign. However, it is difficult to judge whether this change is explained by the higher data quality or are simply due to a selection bias as the sample of countries is restricted here.

Second, we restrict the sample to countries for which the correlation between the inflow and outflow data is significant at the 5 % level. As highlighted in Sect. 2.1.1, this correlation may be positive or negative. The correlation is significant for 10 residence countries.[15] The estimated coefficients are a bit lower, which may be explained by the focus on countries where there is a *positive* correlation between inflows and outflows, which may create an additional downward bias as economic determinants of migration are supposed to have an opposite effect on inflows and outflows. Nevertheless, our main results persist. The results are available upon request.

Finally, we exclude each country one by one in order to make sure that our results are not driven by one single country. It is also an indirect way to ensure that problems in data quality for one country do not explain part of our result. We replicate the estimates for the specification given by column 5 in our previous estimates (with origin-year fixed effects). Whatever the country excluded from the sample, the results are very similar. The estimated coefficient for unemployment in the residence country is always positive and highly significant. It ranges from 0.321 when Spain is excluded to 0.726 when Iceland is excluded. For all other estimates, it is between 0.5 and 0.55.[16]

All in all, our results are not affected by changes in the samples based on the quality of the data. Although we acknowledge that measurement errors may persist, all these additional estimates and the robustness of our results show that we have been able to identify real effects of economic cycles on migration outflows.

4.3.3 Methodological concerns

One concern in the empirical analysis undertaken using the bilateral database is the large occurrence of zeros that may bias the results when using OLS estimators. However, focusing on bilateral flows between Schengen countries, the occurrence of zeros is only 1.35 % in our case, which allows us to use traditional panel data methods. However, as we use the log value of outflows, we drop all nil observations in our estimates. To avoid this problem, we ran estimates using scaled OLS estimators as in Beine et al. (2013). Our dependent variable is transformed and we use $\ln(1 + outflows)$ in order to keep nil observations. We then get 1795 observations instead of 1763 in our baseline regressions. The results are perfectly similar.[17]

[15] Austria, Belgium, Denmark, Finland, the United Kingdom, Italy, Luxembourg, the Netherlands, Norway, and Sweden.

[16] All results are available upon request.

[17] Results are available upon request.

The last concern has to do with the level of clustering. Here, standard errors are clustered at the level of our main variables of interest (destination/year and origin/year). We check the consistency of our results using different levels of clustering (destination, origin, and pair level). This does not affect the significance of our variables of interest.[18]

5 Conclusions

In this paper, we have shown that the economic context is an important determinant of migration *outflows*. We have focused primarily on Schengen countries as free mobility is a fundamental principle of such agreements. By doing so, we have a priori excluded the possibility that migration policies drive our results.

We have shown that an economic downturn in residence countries, especially when characterized by higher unemployment, tends to increase migration outflows. A 10-%-point increase in the unemployment rate leads to an increase of 5.5 % points of outflows. This result shows that short-run economic forces may act as a substitute for migration policies. In economic downturns, policy makers are pushed to implement more restrictive migration policies and to encourage the exit of migrants, but economic short-term fluctuations may have the same effect, qualitatively at least.

We have also provided some evidence regarding the role of an origin country's short-run activity on out-migrants flows. This needs to be further investigated however. Data on return migration still are not available. More generally, the data researchers have had access to so far do not provide information about the destinations chosen by out-migrants, which we need to correctly estimate the impact of the economic activities related to these destinations.

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[18] Growth in residence countries becomes significant (and negative) when standard errors are clustered at the dyadic level

Appendix 1: Results on EU countries

See Table 5.

Table 5 Determinants of migration outflows (EU)

Dep. var. ln(Mig. outflows)	(1)	(2)	(3)	(4)	(5)	(6)
ln(Mig. stock)	0.745***	0.747***	0.747***	1.147***	1.176***	0.849***
	(51.36)	(51.23)	(50.99)	(6.565)	(4.691)	(10.04)
Growth_r	−0.0619		−0.0469	−0.0467	−0.0451	
	(−1.468)		(−1.305)	(−1.290)	(−1.128)	
ln(Unemp.)_r		0.762***	0.717***	0.802***	0.801***	
		(3.867)	(3.667)	(4.182)	(3.676)	
ln(GDP per ca.)_r	−3.439**	−1.882	−0.883	1.350	1.438	
	(−2.438)	(−1.246)	(−0.599)	(0.907)	(0.814)	
Growth_o	0.00691		0.00546	0.00846**		0.00553*
	(1.239)		(0.985)	(2.082)		(1.855)
ln(Unemp.)_o		−0.121*	−0.100	−0.167***		−0.131***
		(−1.852)	(−1.544)	(−3.084)		(−2.885)
ln(GDP per ca.)_o	0.654*	0.397	0.384	−0.451		−0.107
	(1.896)	(1.028)	(0.971)	(−1.578)		(−0.508)
Common language	0.104**	0.104**	0.101**			
	(2.300)	(2.228)	(2.223)			
ln(Dist)	−0.00624	−0.000184	−0.00181			
	(−0.166)	(−0.00484)	(−0.0481)			
Origin FE	Yes	Yes	Yes	No	No	No
Dest FE	Yes	Yes	YES	No	No	No
Year FE	Yes	Yes	Yes	Yes	No	No
Bilat. FE	No	No	No	Yes	Yes	Yes
Origin/year FE	No	No	No	No	Yes	No
Residence/year FE	No	No	No	No	No	Yes
Observations	1935	1933	1933	1933	1938	1933
R-squared	0.943	0.944	0.945	0.975	0.978	0.987

Robust t-statistics in parentheses. Standards errors are clustered at residence-year level in column (1)–(5) and at origin-year level in column (6).

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Appendix 2: Results on EU15 sample

See Table 6.

Table 6 Determinants of migration outflows (EU15)

Dep. var. ln(Mig. outflows)	(1)	(2)	(3)	(4)	(5)	(6)
ln(Mig. stock)	0.700***	0.703***	0.701***	1.771***	1.876***	1.195***
	(30.02)	(29.70)	(29.92)	(8.633)	(7.820)	(8.885)
Growth_r	−0.0499*		−0.0360	−0.0156	−0.0183	
	(−1.984)		(−1.490)	(−0.713)	(−0.799)	
ln(Unemp.)_r		0.494***	0.440***	0.426***	0.375**	
		(3.310)	(3.049)	(2.949)	(2.556)	
ln(GDP per ca.)_r	−2.288**	−2.028*	−1.424	−1.931*	−2.450**	
	(−2.106)	(−1.856)	(−1.351)	(−1.806)	(−2.068)	
Growth_o	0.0120		0.00642	0.00438		0.000543
	(1.125)		(0.546)	(0.583)		(0.107)
ln(Unemp.)_o		−0.106	−0.0891	−0.140**		−0.158***
		(−1.397)	(−1.068)	(−2.557)		(−3.926)
ln(GDP per ca.)_o	−1.016*	−1.127**	−1.113**	−0.352		−0.512**
	(−1.927)	(−2.108)	(−2.083)	(−1.084)		(−2.331)
Common language	0.439***	0.433***	0.436***			
	(7.670)	(7.500)	(7.550)			
ln(Dist)	−0.0185	−0.0171	−0.0193			
	(−0.285)	(−0.260)	(−0.295)			
Origin FE	Yes	Yes	Yes	No	No	No
Dest FE	Yes	Yes	YES	No	No	No
Year FE	Yes	Yes	Yes	Yes	No	No
Bilat. FE	No	No	No	Yes	Yes	Yes
Origin/year FE	No	No	No	No	Yes	No
Residence/year FE	No	No	No	No	No	Yes
Observations	1390	1390	1390	1390	1406	1390
R-squared	0.936	0.937	0.938	0.966	0.970	0.988

Robust t-statistics in parentheses. Standards errors are clustered at residence-year level in column (1)–(5) and at origin-year level in column (6).

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Appendix 3: Results on world sample

See Table 7.

Table 7 Determinants of migration outflows (world)

Dep. var. ln(Mig. outflows)	(1)	(2)	(3)	(4)	(5)	(6)
ln(Mig. stock)	0.648***	0.677***	0.679***	0.836***	0.746***	0.691***
	(39.78)	(44.63)	(44.42)	(9.759)	(7.522)	(18.55)
Growth_r	−0.0547**		−0.0373*	−0.0330	−0.0289	
	(−2.583)		(−1.826)	(−1.491)	(−1.182)	
ln(Unemp.)_r		0.347***	0.283**	0.251*	0.313*	
		(2.619)	(2.067)	(1.649)	(1.752)	
ln(GDP per ca.)_r	−2.065**	−2.153**	−1.670*	−2.366**	−2.353*	
	(−1.989)	(−2.077)	(−1.712)	(−2.008)	(−1.756)	
Growth_o	0.00502**		0.00109	0.000298		−0.000482
	(2.106)		(0.327)	(0.156)		(−0.278)
ln(Unemp.)_o		0.0398	0.0398	−0.0246		0.00872
		(0.913)	(0.915)	(−0.902)		(0.299)
ln(GDP per ca.)_o	0.384***	0.670***	0.659***	0.234**		0.433***
	(3.491)	(4.739)	(4.606)	(2.318)		(4.501)
Common language	0.237***	0.359***	0.359***			
	(4.159)	(5.237)	(5.231)			
ln(Dist)	−0.470***	−0.477***	−0.474***			
	(−24.37)	(−21.93)	(−21.73)			
Origin FE	Yes	Yes	Yes	No	No	No
Dest FE	Yes	Yes	Yes	No	No	No
Year FE	Yes	Yes	Yes	Yes	No	No
Bilat. FE	No	No	No	Yes	Yes	Yes
Origin/year FE	No	No	No	No	Yes	No
Residence/year FE	No	No	No	No	No	Yes
Observations	14,774	10,355	10,319	10,396	15,743	10,396
R-squared	0.870	0.882	0.883	0.947	0.953	0.966

Robust t-statistics in parentheses. Standards errors are clustered at residence-year level in column (1)–(5) and at origin-year level in column (6).

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Appendix 4: Results on a subsample of countries where data reliability is high

See Table 8.

Table 8 Determinants of migration outflows (Sub-sample of countries where data reliability is high)

Dep. var. ln(Mig. outflows)	(1)	(2)	(3)	(4)	(5)	(6)
ln(Mig. stock)	0.793*** (42.51)	0.796***	0.795***	0.859***	0.753***	0.833***
		(42.97)	(42.37)	(5.474)	(4.416)	(5.053)
Growth_r	−0.0364*		−0.0105	−0.000168	−0.00229	
	(−1.946)		(−0.852)	(−0.0119)	(−0.155)	
ln(Unemp.)_r		0.459***	0.427***	0.319***	0.313***	
		(4.276)	(4.529)	(3.908)	(3.720)	
ln(GDP per ca.)_r	1.612	1.846**	2.078**	1.727**	2.031***	
	(1.473)	(2.218)	(2.338)	(2.335)	(2.608)	
Growth_o	0.0135**		0.0125*	0.0124***		0.0124***
	(2.014)		(1.839)	(2.614)		(3.422)
ln(Unemp.)_o		−0.103	−0.0859	−0.0900		−0.0778
		(−1.268)	(−1.037)	(−1.375)		(−1.291)
ln(GDP per ca.)_o	−0.173	−0.00582	−0.315	−0.342		−0.338
	(−0.521)	(−0.0139)	(−0.807)	(−0.898)		(−1.061)
Common language	0.180**	0.176**	0.175**			
	(2.622)	(2.547)	(2.544)			
ln(Dist)	−0.104	−0.101	−0.107*			
	(−1.627)	(−1.604)	(−1.693)			
Origin FE	Yes	Yes	Yes	No	No	No
Dest FE	Yes	Yes	Yes	No	No	No
Year FE	Yes	Yes	Yes	Yes	No	No
Bilat. FE	No	No	No	Yes	Yes	Yes
Origin/year FE	No	No	No	No	Yes	No
Residence/year FE	No	No	No	No	No	Yes
Observations	1179	1179	1179	1179	1179	1179
R-squared	0.952	0.953	0.953	0.984	0.987	0.987

Robust t-statistics in parentheses. Standards errors are clustered at residence-year level in column (1)–(5) and at origin-year level in column (6). Residence countries: Austria, Belgium, Switzerland, Germany, Denmark, Iceland, Luxembourg, Norway and Sweden.

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

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