wiiw

AUGUST 2015

Working Paper 120

Intra-EU Mobility and Push and Pull Factors in EU Labour Markets:

Estimating a Panel VAR Model

Michael Landesmann and Sandra M. Leitner

(in collaboration with Isilda Mara)

The Vienna Institute for International Economic Studies
Wiener Institut für Internationale Wirtschaftsvergleiche

Intra-EU Mobility and Push and Pull Factors in EU Labour Markets:

Estimating a Panel VAR Model

MICHAEL LANDESMANN
SANDRA M. LEITNER

(in collaboration with Isilda Mara)

Michael Landesmann is Scientific Director of the Vienna Institute for International Economic Studies (wiiw) and Professor of Economics at Johannes Kepler University, Linz, Austria.
Sandra M. Leitner and Isilda Mara are Research Economists at wiiw.

This research was supported by the Jubiläumsfonds of the Oesterreichische Nationalbank (OeNB).

Abstract

The analysis of the international migration flows, their determinants and the impact on host countries' labour markets is of great interest in the context of current European developments. This paper analyses the role of EU labour market mobility, specifically cross-border mobility by migrants, in labour market adjustments and, vice versa, how labour market developments across the EU in terms of relative wage differences, differences in activity rates, in labour productivity differentials and in human capital structures affect labour mobility. The analysis is carried out in the context of estimating a panel Vector Auto Regressive (pVAR) model involving bilateral net migration flows and cross-country differences in the above variables. It is estimated for the period 2000 to 2012, thus capturing also the two waves of accession of Central and Eastern European new Member States (NMS). The estimations are performed for cross-border mobility patterns for the EU as a whole, as well as for the migration patterns between NMS and OMS, thus analysing the changes which the integration of new Member States may have caused to labour market and mobility dynamics in the European Union.

Keywords: labour mobility, determinants of migration flows, European Union, new Member States, econometric analysis of labour mobility, panel VAR model, push and pull factors of migration

JEL classification: F22, J61, J62, J63, R23

CONTENTS

TABLES AND FIGURES

Appendix

Executive summary

The analysis conducted in this paper estimates a number of panel Vector Auto Regressive (pVAR) models to elucidate the determinants of net migration flows between the member countries of the European Union (the wider sample) and the more specific migration flows between the new Member States (NMS) from Central and Eastern Europe which joined the Union in 2004 and 2007 respectively and the old Member States (OMS) (the more restricted sample). The model allows an examination of how differences in labour market variables (real wages, productivity levels, activity rates, human capital structures) between sending and receiving countries as well as past migration affect net migration flows. And the other way round, how net migration flows affect differentials in labour market indicators across these sets of economies, as well as examines interactions amongst the labour market variables themselves. The model can be applied to yield impulse response functions (IPRs) which are then interpreted to see how changes in ('shocks to') labour market indicators affect net migration rates and, vice versa, what effects net migration flows might have on these labour market differentials. Starting with **determinants of net migration flows**, here is a summary of the main results obtained:

› Consistent/robust evidence across all specifications and country samples was found of 'network effects': high **net migration** in the past encourages/induces further net migration; the effect tends to decline over time;

› Robust evidence across all specifications and country samples was also found for the impact of a relative increase in **real wages** in the sending country relative to that in the potential host country: a reduction in the wage differential significantly reduces net migration flows; hence, higher relative wages in the sending country increase the incentive to stay;

› A relative increase in **real labour productivity** levels in the sending country (i.e. a positive shock to the labour productivity differential) results in lower net migration; the effect is, however, only significant in a more parsimonious specification (where wage differentials are excluded as wage and productivity differentials are highly correlated); hence, there is a greater incentive to stay and profit from real labour productivity improvements at home instead of migrating;

› Because of non-stationarity of the variable in the case of some economies we had to exclude the relative **employment rate** variable from our estimations;

› There is, however, consistent/robust evidence across all specifications and country samples that an increase in the **activity rate** (i.e. share of the working-age population which either has a job or is looking for a job) in the (potentially) sending country or a decrease in the activity rate in the (potentially) receiving country will encourage net migration. The impact of a 'shock' to relative activity rates tends to materialise relatively late for the total sample (5 to 7 periods after the shock) but relatively early (around 2 to 3 periods after the shock) for the NMS-to-OMS sample. The interpretation of this variable is that as existing labour potentials in receiving countries decline or in the (potentially) sending country increases there would be a stronger influx of migrant workers to satisfy labour demand, rendering job search a more successful endeavour; however, the lagged/sluggish response seems to indicate that net migration flows respond only after lags to such changes in the relative availability of active labour forces in the two sets of economies;

- A relative increase in the **human capital index** in the sending country relative to that in the host economy (i.e. a decline in human capital endowment differentials) discourages net migration; this effect is significant only for the total sample (in all but the full specification) but consistently insignificant for the NMS to OMS sample. This could be due to either human capital endowments not being very different between NMS and OMS and/or other variables such as real wages, productivity differentials and activity rates being the more important drivers of net migration flows.

As regards the **effects of net migration flows on the other variables** of the model, the following patterns emerged:

- Higher net migration (i.e. a positive shock to net migration) has mixed effects on **real wage differentials**: insignificant for the total sample but significant for the NMS-to-OMS sample in the following manner: higher net migration of NMS citizens to OMS countries (supply-side shock) leads to a reduction of prevailing real wage differentials between NMS and OMS countries. This is a confirmation of the impact of labour mobility in reducing real wage differentials and underlying labour market disequilibria and a potential confirmation of Borjas' (2001) 'greasing of the wheels' effect of labour mobility in an integrated market environment;

- Higher net migration (i.e. a positive shock to net migration) results in higher **real labour productivity differentials**; however, the effect is only significant for the NMS-to-OMS sample, suggesting that stronger net migration of NMS citizens to OMS host countries might significantly reduce aggregate real labour productivity levels in OMS countries (or conversely, increase real labour productivity levels in NMS countries); this effect is limited to the initial years following the shock only, either pointing to a temporary adjustment process that needs to take place in the course of absorbing larger pools of foreign workers in the OMS economies or implying a return to employment-output ratios in NMS after an adjustment phase; in any case, the effect is not robust in relation to the estimation of a more parsimonious version of the model (dropping the real wage differential);

- Higher net migration (i.e. a positive shock to net migration) has a significant impact on **activity rate differentials**: this appears only for the NMS-to-OMS sample and the limited specification (excluding productivity level differentials). It suggests that higher net migration of NMS citizens to OMS countries leads to significantly higher activity rates in the OMS host countries, which probably could be due to the compositional effect of recent migrants from NMS (which show higher activity rates) affecting the aggregate activity rate in the OMS in a positive manner. The reverse composition effect could happen in the NMS where the emigration of the more employment-searching individuals reduces the aggregate activity rate.

- Finally, higher net migration (i.e. a positive shock to net migration) results in a robust significant negative impact on **human capital differentials** from the point-of-view of the sending country and a positive impact on the receiving country for the total sample; the effect is not significant for the NMS-to-OMS sample. For the overall sample, the effect indicates the impact of net migration in the direction of either skilled migration or an incentive effect to up-grade human capital structures of the domestic population in the light of actual or expected migration from other EU economies.

1. Introduction

Within Europe, the mobility of workers has intensified significantly during the last two decades. First, because of the impact of the gradual implementation of the Single Market's four freedoms (together with some movement towards harmonisation of regulations, degree recognition, etc.) amongst the older members of the EU; secondly, as a result of the collapse of the Central and Eastern European communist bloc, the disruptions caused by transition including regional conflicts (such as in ex-Yugoslavia); and thirdly, because of the relaxation of restrictions on the movement of people and workers in the course of the EU enlargements in 2004 and 2007. Nonetheless, the global financial crisis and the subsequent economic recession might have slowed down the flow of migrant workers from EU-8[1], EU-2[2] or non-EU countries due to the downturn in general labour demand.

Particularly during the last decade, intra-EU labour mobility has contributed as a response mechanism to high levels of unemployment, to filling labour market shortages, sustaining sectors of economic activity where natives are not willing to work and the creation of new jobs in response to technological change. However, the heterogeneity across EU regions, characterised by significant regional differences in terms of income levels, growth, employment opportunities and wages – particularly between new EU Member States (NMS) and old EU Member States (OMS) – has led to diverse patterns of labour mobility in the EU. Moreover, the EU has experienced significant changes in employment structures with significant adjustments that have produced important shifts within and between economic sectors and in skill structures.

Against this backdrop, we investigate the relationship between labour mobility and labour market adjustments in the EU, shedding light on how labour mobility triggers and affects labour market adjustments and, conversely, how changes in labour market structures across the EU affect labour mobility. In particular, it focuses on the period between 2000 and 2012, which is characterised by the accession of Central and Eastern European new Member States (NMS). The ensuing analysis is performed for two different country groups, namely the EU as a whole as well as the relationships between NMS and OMS, therefore analysing the changes and effects, which the integration of new Member States might have caused to labour market and mobility dynamics in old Member States.

Methodologically, following Mitze et al. (2012), we use a panel Vector Autoregressive Model approach and specify a system of equations to describe and capture the effects of migratory movements on labour market outcomes (in terms of relative wage differences, differences in activity rates, labour productivity levels and human capital structures), but, conversely, also identify how changes in labour market structures affect net migration across the EU.

The rest of the paper is structured as follows: section 2 provides an overview and discussion of the theoretical and empirical literature on causes and effects of migration. Section 3 discusses the model tested and the data used in the analysis while section 4 briefly introduces the panel Vector Auto-

1 Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia, Slovenia.

2 Bulgaria and Romania.

Regressive (pVAR) approach applied in the analysis. Section 5 presents and discusses results of the empirical analysis for the EU as a whole as well as separately for the group of NMS as sending countries and the OMS as host countries. A robustness check of results is conducted in section 6 to explicitly take the potential distortive effects of issues of multi-collinearity inherent in the data into account. Section 7 adds some additional analysis of ‘country-to-country specific’ network effects. Finally, section 8 summarises and concludes.

2. Recent findings on causes and effects of migration

Generally, the theoretical and empirical literature on the causes and effects of migration is vast and diverse, differing in many respects. First, in terms of the number and types of host countries analysed: typically, the majority of studies on international migration focuses on a single, primarily English-speaking, developed country only. Second, in terms of periods considered, ranging from the first wave of mass migration in the early 19th century (Hatton and Williamson, 1994, 1997 and 2008) to more recent migration waves, coming from a more diverse pool of sending countries (Zimmermann, 2005). Or third, in terms of the particular methodological approach applied. This multidimensional diversity partly explains why empirical results are rather mixed and far from conclusive.

2.1 CAUSES OF MIGRATION

Economic theory and empirical evidence stress that people move across countries or regions for different reasons. Theoretically, early theories of migration point to the importance of spatial disparities in income or wages as a major driver of migration (Smith, 1776 or Hicks, 1932). In this tradition, prevailing wage differentials cause migration to flow from low wage to high wage countries, until, due to migration-induced changes in labour supply, wages eventually equalise, putting a natural halt to further migration. Traditionally, unequal income opportunities across regions or countries are attributed to differences in input factor endowments, rendering migration to flow from relatively labour abundant countries (relative to capital) with low marginal returns to labour and consequently low wages to relatively labour scarce but high labour productivity, high wage countries. By and large, in spite of differences in the measures used to proxy income or wage differentials as well as differences in terms of methodological approaches, empirical evidence overwhelmingly supports the wage-differential hypothesis of migration (see, e.g., Clark, Hatton and Williamson, 2007; Gross and Schmitt, 2012; Hatton and Williamson, 2002; Ortega and Peri, 2009 or Mayda, 2010).

Furthermore, as highlighted by Todaro (1969, 1976) and Harris and Todaro (1970), in addition to differences in *expected* levels of income of the home and destination countries, the size of labour migration between countries also strongly depends on differences in employment opportunities across countries. Accordingly, migration is expected to flow from countries characterised by high unemployment with poor employment opportunities to those with low unemployment but favourable employment opportunities. Generally, empirical evidence tends to support the hypothesis that host country unemployment is a disincentive for migration (see, e.g., Islam, 2007; Hatton and Tani, 2005 or Pope and Withers, 1985).

Furthermore, the importance of migrant heterogeneity and their socioeconomic characteristics for the decision to migrate was emphasised by Sjaastad (1962). According to his human capital model of migration, which treats migration as an investment decision of an individual, individuals migrate if the present discounted value of expected returns to their human capital in a potential destination region (net of costs of moving) exceeds the returns at home, eventually giving rise to diverse and very skill-specific migration patterns. Moreover, it highlights the importance of age, rendering younger migrants who have a longer expected lifetime gain from migration more likely to migrate.[3] Drawing on Sjaastad (1962), Borjas (1987, 1991) developed two immigration models, which, in addition to cross-country differences in mean incomes and migration costs, put strong emphasis on differences in human capital and schooling structures across countries as key determining factors of international migration flows. In particular, Borjas (1987) assumes that people in home and destination countries differ in their socioeconomic characteristics like abilities, education, age and the like so that the migration decision also depends on how well a migrant worker's abilities and human capital can be used and are valued and remunerated abroad, i.e., the returns to skills. Differences in home and destination countries' dispersion of earnings – as indication for relative earnings opportunities at home and abroad – as well as the degree of skill transferability are key to overall migration rates, on the one hand, and observable skill-specific migration patterns, on the other. Particularly, the model implies an inverted U-shaped relationship between the migration rate and relative inequalities between, on average, poorer home and richer destination countries: given sufficient transferability of skills across countries, a mean-preserving increase in income inequality of the home country – which reduces the income of the poorest but improves the income of the richest – leads to a higher migration rate should home county inequality initially be relatively lower than inequality in the destination country. In the case of equal inequalities in home and destination countries, the emigration rate is greatest since average income is higher in the destination country, irrespective of the level of skills, inducing all people to move to the richer destination country. However, the migration rate falls in response to an increase in income inequality of the home country, should home country inequality initially be relatively higher than inequality in the destination country. Furthermore, it highlights that migrants with particular skills self-select into particular destination countries, depending on relative wage inequalities between home and destination country: negative selection of migrants with below average skill-levels occurs in host countries with relatively high wage inequality while positive selection of migrants with above average skill-levels occurs in host countries with relatively low wage inequality. Empirical evidence supporting the inverse U-shaped relationship between the migration rate and relative inequalities is provided, for instance, by Clark et al. (2003) for the United States and a panel of 81 source countries for the years 1971 to 1998. On the contrary, no conclusive evidence emerges for the role of relative inequality for the selectivity of international migrants (see Belot and Hatton, 2012 or Stolz and Baten, 2012 for a confirmation of the model's prediction and Brücker and Defoort, 2006 or Feliciano, 2005 for a rejection thereof).

In addition, the decision to migrate is also affected by the costs of moving and the associated adjustment costs, like material costs of traveling (typically proxied by geographic distance) or costs to overcome cultural or linguistic distances or to adapt to new labour markets but also psychological and social costs of cutting old ties and forging new ones. In particular, with respect to the latter, much emphasis is put on the network approach, which postulates that due to social and information networks from established immigrant networks in the host country, the costs and risks of migration are lowered, rendering migration a self-reinforcing process (Massey et al., 1998). Indeed, empirical evidence corroborates the assertion that costs curb migration while network effects facilitate and foster migration: migration flows tend to decline with distance (Ortega and Peri, 2009; Pedersen et al., 2008) while ethnic networks in the destination country (as proxied by the stock of migrants in the destination country) encourages migration (Clark et al., 2007; Massey and Aysa, 2005 or Pedersen et al., 2008). On the contrary, the potential

3 See Millington (2000) for a more nuanced analysis of age-specific determinants of migration.

adjustment costs associated with overcoming linguistic differences produce mixed results (see, e.g., Mayda 2010; Ortega and Peri, 2009; Bonin et al., 2008 or Pedersen et al., 2008).

Similarly, besides income differentials, other forms of financial incentives such as generous state transfers and welfare systems or the availability and quality of public goods can act as magnets for migration (Borjas, 1999; see Day, 1992 or Giulietti and Wahba, 2012 for an overview of the welfare magnet hypothesis).

Additionally, immigration policies in destination countries are shown to be key to migration flows. In particular, as expected, restrictive immigration policies are proven to significantly curb immigration flows (Bertoli and Fernández-Huertas Moraga, 2011; Mayda, 2010; Ortega and Peri, 2008), further fuelling the policy debate on how to effectively control the flow of migrants.

However, recent empirical evidence highlights that the decision to migrate is more complex and not primarily economically motivated but rather an expression of more varied tastes and lifestyle choices. In particular, people are found to move for love (Favell, 2011; King, 2002), adventure (Favell, 2011) or self-development (Chiang et al., 2013).

2.2 EFFECTS OF MIGRATION

The effects of immigration on host country labour markets and economies are complex and diverse, strongly depending on the nature of the migration-induced change in labour supply.

Generally, the theoretical literature emphasises that the effects of immigration on wages and employment strongly depend on the socioeconomic and demographic characteristics of both the immigrant and native populations in terms of the substitutability or complementarity of their labour (see Chiswick et al., 1992 or Chiswick, 1998). Accordingly, the higher the substitutability of foreign for native workers, the higher the chances that increased immigration increases competition in the labour market and depresses wages of the domestic labour force. However, if wages are inflexible downwards due to the presence of strong unions and their unwillingness or inability to accommodate increased immigration, unemployment is expected to increase instead (or inactivity, should existing workers fail to accept new lower wages). On the contrary, however, if immigrants are complements to native workers, increased immigration is expected to result in higher productivity and consequently higher wages of native workers. Generally, the vast empirical literature finds little (positive as well as negative) effect or no significant effect at all of migration on either wages or employment of native workers (see, e.g., Kerr and Kerr, 2009 or Kahanec and Zimmermann, 2009 for overviews). However, migrants are far from a homogeneous group but come with very different skills in tow, naturally affecting wages and employment of native workers differently, depending on their own skill endowment and the substitutability or complementarity of native for foreign skills. For instance, Borjas (1995) models the impact of migration on the wage structure of the host country in a perfectly competitive setting featuring skilled and unskilled workers and highlights that, as expected, an inflow of migrants has a negative effect on skill-specific wages if immigrants' skills are substitutes to natives' skills. And the closer the substitute, the greater the adverse wage effects are expected to be. However, a positive effect on skill-specific wages can be expected if immigrants' skills are complements to natives' skills instead. The empirical test of the wage impact of high-skilled immigration in the United States strongly supports this assertion (Borjas, 2005).

In addition to wage and employment effects, migration can also affect the human capital formation in both the home and the destination country. Particularly, as has been argued in a series of theoretical papers (e.g., Stark et al., 1998; Vidal, 1998), the prospects of migrating may help spur human capital accumulation and skill acquisition *at home*, raising the average level of education there. In particular, if returns to education are higher abroad than at home, the possibility of migration increases expected returns to education, which in turn, induces more domestic investment in education and skill acquisition at home. However, since only a fraction of the educated will eventually migrate (brain drain), the average level of education in the remaining population can increase (brain gain). Generally, the majority of empirical evidence seems to corroborate the hypothesis that a higher probability of migration is associated with an increase in the level of human capital accumulation (Beine et al., 2008; Di Maria and Lazarova, 2009; Docquier and Rapoport, 2006 and 2012). By contrast, the potential effects of immigration on human capital formation of natives in the *host country* have received comparatively little attention so far. The limited empirical evidence, however, points to beneficial effects on natives' human capital formation. For instance, Regets (2001) discusses the likely positive and negative effects of high-skilled migration for the US economy. He emphasises that high-skilled immigration positively affects natives' human capital formation: first, by improving the profitability of investment in higher education, it encourages investment in higher education among natives; second, against all apprehensions of a strong displacement effect of native students by foreign ones, it leads to higher enrolment in graduate programmes. Similarly, Hunt (2012) studies the impact of immigration on the high school completion of natives in the United States and finds that an increase in the share of immigrants in the population increases the probability of natives to attain 12 years of schooling, with stronger effects for the black native-born population. McHenry (2015) addresses the response of young natives to low-skilled immigration – which is of particular importance in the United States – and demonstrates that low-skilled immigration induces US youth to attain more secondary and post-secondary schooling and to increase their academic success through higher school attendance, grades and test scores.

Furthermore, immigration also affects the productivity of host countries, though effects tend to depend on the type of migrants considered. For instance, Boubtane et al. (2014) study the effects of net migration on productivity growth in 22 OECD countries between 1986 and 2006 and show that migration – predominantly through human capital accumulation – has a positive effect on productivity growth, though the effect is rather small: a one percentage-point increase in foreign-born net migration increased productivity growth by three-tenths of a percentage-point per year on average. Similarly, Hierländer et al. (2010) analyse the migration of highly skilled workers in the EU and its effects on productivity development. They highlight the importance of national immigration policies for attracting tertiary educated labour force and point to a positive correlation between higher shares of migrants in the labour force and higher growth in productivity in the group of technologically more advanced sectors of the economy. On the contrary, no significant effects of immigrants on TFP changes are detected by Ortega and Peri (2009) who study bilateral immigration flows from 74 countries of origin into 14 OECD countries from 1980 to 2005 while Peri (2012) for 50 US states (between 1960 and 2010) finds a positive significant relationship between immigration and TFP growth.

On the contrary, the effects of immigration on innovation has received comparatively little attention so far, despite the important role attributed to knowledge formation and technical change for the productivity and growth of economies by the endogenous growth tradition (Solow, 1957; Romer, 1990; Aghion and Howitt, 1992; Grossman and Helpman, 1994) and the key role played by highly skilled workers in that process, which, to a large extent, come from abroad. Generally, the empirical literature in this area has predominantly focused on the United States while comparable evidence for Europe is still scarce. Results highlight that skilled foreign workers and higher ethnic diversity in research personnel are associated with more innovation and patenting. For instance, Hunt and Gauthier-Loiselle (2010) or Kerr and Lincoln (2010) emphasise the positive contribution of foreign college graduates and highly skilled immigrants to US patenting activities while Bosetti et al. (2015) point to a similar positive role of a large pool of skilled migrants for the creation of private knowledge – measured by the number of patent applications – as well as for more public basic research – measured by the number of citations to published articles – in the EU. Similarly, ethnic and cultural diversity is also found to matter for innovation: Nieburg (2009) for German regions and Ozgen et al. (2011) for 170 EU regions both stress the importance of ethnic and cultural diversity of the (skilled) labour force for patenting activities.

Moreover, whether immigrants are net contributors to or net recipients of public finances has become a major concern and topical issue in the public policy debate in many economies since, due to less favourable employment prospects, immigrants may further aggravate the still inflated fiscal imbalances that resulted from the recent global financial crisis or further worsen the fiscal impact of ageing. Empirical evidence on the fiscal effects of immigration is diverse but generally seems to point to low or no effects at all (see, e.g., Rowthorn (2008) for an overview). However, observable fiscal effects tend to differ strongly by immigrant group or by particular host country analysed. In general, evidence suggests that more educated, younger and less recent migrants tend to contribute more to public finance than they use in terms of public goods and services (Storesletten, 2000, 2003; Gustafsson and Österberg, 2001; Dustmann and Frattini, 2013).

2.3 THE JOINT ANALYSIS OF CAUSES AND EFFECTS OF IMMIGRATION

More recently, a new strand of literature has emerged, which analyses the relationship between immigration, on the one hand, and host country labour market conditions, on the other, by means of (panel) vector autoregression (VAR) analysis. This particular approach offers two major advantages: first, it allows for the *joint* analysis of both the causes for and effects of migration on host country labour markets, which past research was unable to address; second, it allows for the identification of the effects of migration at different points in time and therefore helps to trace them across time. Since the ensuing analysis also uses a panel VAR to analyse drivers and effects of migration, we provide a more thorough discussion of the findings following this approach in what follows.

In general, with respect of *causes of migration*, there is strong evidence that wages are an important determinant, though the effects tend to differ across skill-groups. In this respect, the study by Barcellos (2010), which analyses the relationship between immigration, wages and internal migration for a panel of 38 US states for the period 1982-2007, points to a non-negligible role of wages. It highlights that a 10 per cent increase in wages in a state causes an up to 20 per cent increase in the rate of inflow of new migrants to that state after 3 years. Furthermore, broken down by skill groups, the results point to the strong responsiveness of low-skilled immigrants to wage improvements: a 3 per cent increase in low-skill wages increases the inflow of low-skilled immigrants by more than 8 per cent while no significant effect is observable for high-skilled immigrants. In a similar vein, as demonstrated by Boubtane et al. (2010) in a study of 22 OECD countries, growth – as proxied by real GDP per capita – is another important driver of immigration. The migration-enhancing effect of growth, however, takes some time to take effect.

Similarly, the decision to migrate is also affected by employment opportunities and the chances of finding employment in the host country. Generally, a high unemployment rate in the host country tends to discourage immigration (Boubtane et al., 2010; Damette and Fromentin, 2013). However, there is no evidence that the unemployment rates of either the native or the foreign-born matter in that respect which suggests that migrants tend to look at the overall aggregate employment rate when they decide where and when to migrate instead of the unemployment rate of fellow-migrants residing abroad.

Additionally, immigration policies in destination countries are also important determinants of migration, with more restrictive migration policies adversely affecting immigration. In this respect, Damette and Fromentin (2013) use a trivariate VECM model to shed light on the short- as well as long-term effects of immigration on host country wages and employment in 14 OECD countries (between 1970 and 2008). They demonstrate that more restrictive migration policies – captured by an index of tightness of immigration reforms and entry law – significantly reduce the influx of migrants. This effect, however, differs by the particular country sample analysed: for the group of Anglo-Saxon countries comprising traditional immigration countries such as Australia, Canada, the UK and the United States, more restrictive migration policies indeed tend to curb immigration. However, no significant effect emerges for the group of European countries, comprising new European immigration countries like Italy or Spain as well as post-colonial immigration and active recruitment countries like Belgium, France, Germany or the Netherlands.

This strand of literature also simultaneously addresses labour market *effects of migration,* but produces mixed results, which is partly a result of differences in countries (or states and regions) and time periods covered. Generally, however, emerging effects of immigration on host country labour market outcomes are low or non-existent even. For instance, Barcellos (2010) highlights that immigration does not exert a significant effect on wages. On the contrary, Damette and Fromentin (2013) point to interesting differences in short- and long-term effects and highlight that while an increase of migrants tends to lead to an increase in host-country wages in the short-run, a decrease in wages is observable in the long-run. Following Harris and Todaro (1970), Mitze et al. (2012) model cross-regional migration dynamics in Germany as a function of both home and host regional characteristics and show that higher net-migration results in a small but temporary drop in wage differences between home and host regions. This finding supports the notion that the mobility of migrants helps contribute to the convergence of income levels across regions.

Empirical evidence appears more consistent concerning any employment-effect of migration but finds little evidence of an adverse employment effect, irrespective of the time horizon considered (see, e.g., Damette and Fromentin, 2013 for the short- and long-term effects on unemployment) or the particular measure used to capture employment opportunities in the host country. In particular, Boubtane et al. (2010) demonstrate for a set of OECD countries that migration exerts a negative impact on the overall unemployment rates but also on the unemployment rates of both native-born as well as foreign-born workers. Hence, both types of workers profit from immigration in terms of more favourable employment opportunities.

Finally, related empirical evidence also points to other important effects of migration. In this respect, there is some indication of a positive growth effect of migration (Boubtane et al., 2013), a mixed effect on real labour productivity (i.e. negative initially but positive in the long-run (see Damette and Fromentin, 2013)) or a positive effect on both labour market participation and human capital accumulation (Mitze et al., 2012).

3. Determining effects of intra-EU mobility

Theoretically, the approach applied in the ensuing analysis is based on Harris and Todaro (1970), on the one hand, who model an individual's decision to migrate as a function of expected income as well as Mitze et al. (2012), on the other, who explains net migration across regions, explicitly accounting for the simultaneous nature of migration and labour market conditions.

In particular, Harris and Todaro (1970) model regional migration as an individual's decision to move across regions as a function of the expected income from staying in the region of residence (which is a function of the income in the current region of residence and of the probability of being employed in the current region of residence which, in turn, is determined by the unemployment rate and a set of economic and non-economic determinants) and the expected income from moving to another region (as a function of the income in the new host region and of the probability of being employed in the new host region), explicitly also accounting for the costs of moving between regions.

Following Harris and Todaro (1970), Mitze et al. (2012) then model net migration across regions but suggest to use a larger set of equations to overcome theoretical restrictions and to allow the data to determine the relationship between migration, on the one hand, and labour market outcomes, on the other.

The ensuing analysis is based on Mitze et al. (2012) and intends to explicitly account for the role of both labour demand and supply side shocks for net migration flows and related labour market outcomes. In this respect, as argued by Partridge and Rickman (2003), changes in wages and employment levels are labour demand drivers while changes in migrant workers or the supply of native workers are supply side drivers.

Generally, following Mitze et al. (2012), net migration across countries is specified as follows:

$$\mathrm{MNET}_{ij,t} = \alpha_{10} + \alpha_{11}(\mathrm{L})\mathrm{MNET}_{ij,t-1} + \alpha_{12}(\mathrm{L})\mathrm{W}_{ij,t-1} + \alpha_{13}(\mathrm{L})\mathrm{ER}_{ij,t-1} + \alpha_{14}(\mathrm{L})\mathrm{LP}_{ij,t-1} + \alpha_{15}(\mathrm{L})\mathrm{AR}_{ij,t-1} + \alpha_{16}(\mathrm{L})\mathrm{H}_{ij,t-1} + \varepsilon_{ij,t} \tag{1}$$

where (L) is the lag operator. $\mathrm{MNET}_{ij,t}$ refers to net migration, defined as the difference in migration flows – i.e. the difference between immigration and emigration flows – between country i and j at time t, which is explained by a set of lagged explanatory variables. Except for net migration (and its lags), all explanatory variables are defined as differentials between the sending country i and the receiving country j. In particular, net migration is assumed to be determined by the following lagged variables:

› Past net migration flows ($(\mathrm{L})\mathrm{MNET}_{ij,t-1}$) between country i and j are included to account and test for the potential persistence in net migration flows, such that high net migration in the past gives rise to high contemporary net migration. Generally, in line with related empirical evidence (Mitze et al., 2012), we expect to find strong persistence in net migration.

› Real wage differences between sending country i and destination country j ($(\mathrm{L})\mathrm{W}_{\mathrm{ij,t-1}}$) are included to test the hypothesis that spatial disparities in wages are major drivers of migration flows, as advocated by early theories of migration and supported by vast empirical evidence. Accordingly, we expect migration to flow from low wage to high wage countries and for migration to decrease as a consequence of wage convergence across countries.

› Differences in employment rates between sending country i and destination country j ($(\mathrm{L})\mathrm{ER}_{\mathrm{ij,t-1}}$) are included to test the hypothesis that relative employment opportunities in home and host countries are important determinants of migration. Specifically, favourable employment opportunities in a potential destination country renders job search a relatively easy and more successful endeavour, making migration more attractive and likely. Therefore, we expect migration to flow from countries with low employment rates to countries with high employment rates and for migration to decrease should employment rate differentials narrow between countries.

› Differences in real labour productivity levels between sending country i and destination country j ($(\mathrm{L})\mathrm{LP}_{\mathrm{ij,t-1}}$) are expected to affect net migration flows between countries. Endogenous growth theory puts strong emphasis on innovation and technical change to determine observable differences in productivity levels across countries. In this respect, technologically advancing economies experience improvements in labour productivity, which in turn, leads to an increase in the demand for labour and in wages (as long as technical change is not labour saving). Hence, technologically advancing economies are attractive locations for migrants so that we expect migration to flow from countries with low labour productivity to countries with high labour productivity and, consequently, emigration flows to fall in the course of technological catching-up of lagging economies, which helps narrow prevailing labour productivity gaps.

› Furthermore, net migration flows are also determined by differences in activity rates between sending country i and destination country j ($(\mathrm{L})\mathrm{AR}_{\mathrm{ij,t-1}}$). In particular, low activity rates in the destination country are reflective of less saturated labour markets with little competitive pressures, which tends to encourage immigration. Furthermore, labour migration – i.e. migration related to seeking employment abroad – is more likely and easier for migrants with an active labour market status who are employed or seek employment than for inactive migrants. Hence, we expect migration to flow from countries with high activity rates to those with low activity rates. But we expect migration to fall should activity rates converge across economies.

› Differences in human capital endowments between sending country i and destination country j ($(\mathrm{L})\mathrm{H}_{\mathrm{ij,t-1}}$) also matter for migration flows between countries. In particular, human capital differentials are included to test the hypothesis put forward by Borjas (1987, 1991) that the migration rate depends on differences in human capital and schooling structures across countries. More specifically, Borjas (1991) argues that due to higher educational premia in the destination country, migration rates are higher in sending countries with a more skilled labour force. As against this hypothesis there might also be another one which would lead to the opposite sign to be expected on this variable: countries with strong differences in human capital endowments might be more complementary in terms of the skills that migrants would supply, and hence one would expect higher general migration flows between countries with strongly different human capital structures. We shall refer to this hypothesis the H-O hypothesis (in analogy to the Heckscher-Ohlin theorem in trade theory).

› Finally, $\varepsilon_{\mathrm{ij,t}}$ refers to the error term.

Furthermore, account is taken of how net migration and changes thereof (together with a set of additional labour market indicators) affect labour market outcomes. Particularly, since migration and labour market conditions are determined jointly, the following system of equations is specified:

$$W_{ij,t} = \alpha_{20} + \alpha_{21}(L)MNET_{ij,t-1} + \alpha_{22}(L)W_{ij,t-1} + \alpha_{23}(L)ER_{ij,t-1} + \alpha_{24}(L)LP_{ij,t-1} + \alpha_{25}(L)AR_{ij,t-1} + \alpha_{26}(L)H_{ij,t-1} + \varepsilon_{ij,t} \quad (2)$$

$$ER_{ij,t} = \alpha_{30} + \alpha_{31}(L)MNET_{ij,t-1} + \alpha_{32}(L)W_{ij,t-1} + \alpha_{33}(L)ER_{ij,t-1} + \alpha_{34}(L)LP_{ij,t-1} + \alpha_{35}(L)AR_{ij,t-1} + \alpha_{36}(L)H_{ij,t-1} + \varepsilon_{ij,t} \quad (3)$$

$$LP_{ij,t} = \alpha_{40} + \alpha_{41}(L)MNET_{ij,t-1} + \alpha_{42}(L)W_{ij,t-1} + \alpha_{43}(L)ER_{ij,t-1} + \alpha_{44}(L)LP_{ij,t-1} + \alpha_{45}(L)AR_{ij,t-1} + \alpha_{46}(L)H_{ij,t-1} + \varepsilon_{ij,t} \quad (4)$$

$$AR_{ij,t} = \alpha_{50} + \alpha_{51}(L)MNET_{ij,t-1} + \alpha_{52}(L)W_{ij,t-1} + \alpha_{53}(L)ER_{ij,t-1} + \alpha_{54}(L)LP_{ij,t-1} + \alpha_{55}(L)AR_{ij,t-1} + \alpha_{56}(L)H_{ij,t-1} + \varepsilon_{ij,t} \quad (5)$$

$$H_{ij,t} = \alpha_{60} + \alpha_{61}(L)MNET_{ij,t-1} + \alpha_{62}(L)W_{ij,t-1} + \alpha_{63}(L)ER_{ij,t-1} + \alpha_{64}(L)LP_{ij,t-1} + \alpha_{65}(L)AR_{ij,t-1} + \alpha_{66}(L)H_{ij,t-1} + \varepsilon_{ij,t} \quad (6)$$

Methodologically, this set of equations is tested empirically by means of a panel Vector Autoregressive (pVAR) model (see section 4 for a more thorough discussion of the merits and challenges of this particular approach), which allows the joint analysis of labour market dynamics and migration effects across countries.

The ensuing analysis uses detailed individual country data for a set of old EU Member States (OMS) and new EU Member States (NMS) for the period 2000-2012 which coincides with the period of EU enlargement in 2004 and 2007 and the implementation of transitional arrangements about mobility of workers in the European Union. In particular, it uses different Eurostat datasets and population statistics for 17 OMS and NMS countries[4] between 2000 and 2012, ultimately attaining a matrix of migration in- and outflows for 17 destination countries, 16 sending countries and 12 years. In addition, two different country samples are analysed separately in what follows: First, the overall sample which captures migration dynamics across all 17 old and new EU countries to shed light on drivers and effects of migration across a representative sample of OMS and NMS countries. Second, the NMS-to-OMS sample which captures migration dynamics between all 6 new Member States (as countries of origin) and all 11 old Member States (as countries of destination) to show how the integration of new Member States has contributed to mobility and to labour market dynamics and outcomes in old Member States. For further details on data sources see Table A.1 in the Appendix.

The data was tested for non-stationarity by means of the Im-Pesaran-Shin (IPS) unit root test, which tests the null hypothesis that all panels contain unit roots versus the alternative that some panels are stationary. Test results emphasise that except for employment rate differentials, which turn up non-stationary in both country samples, the null hypothesis of non-stationarity is always rejected (see Table A.5). Hence, to avoid the distortive effect of non-stationarity on empirical results, the ensuing

[4] In this study old EU Member States (OMS) are represented by Austria, Belgium, Denmark, Finland, Germany, Ireland, Italy, Netherlands, Spain, Sweden, United Kingdom and new EU Member States (NMS) are represented by Hungary, Lithuania, Poland, Romania, Slovakia and Slovenia.

analysis drops employment rate differentials from the list of variables and analyses a 5-variable pVAR system in levels, containing net migration flows ($\mathrm{MNET}_{\mathrm{ij,t}}$), real wage differentials ($W_{ij,t}$), real labour productivity differentials ($LP_{ij,t}$), activity rate differentials ($LP_{ij,t}$) and human capital differentials ($H_{ij,t}$). Furthermore, based on the Akaike information criterion (AIC), a pVAR(1) model with 1 lag is estimated (see Table A.5 for test statistics).

An overview of immigration flows between 2001 and 2012 of EU-27 citizens to the EU-17 as well as emigration flows of EU-17 citizens to the EU-27 are depicted in Figures A.1 and A.2 in the Appendix. Given the relative size of the countries, Figure A.1 highlights that for the 17 countries included in the analysis, immigration flows from the EU-27 were particularly high for Germany, the UK, Italy and Spain, but also for Ireland. We can see that the crisis had a very strong impact on the ‘Southern economies’ Italy and Spain (and also Ireland) which all had sharply increasing immigration flows prior to the crisis and these then dropped sharply. There was also a strong temporary dip in immigration in Germany in 2009 but immigration flows recovered relatively quickly to pre-crisis levels by 2012. Similar patterns can be observed by other ‘Northern’ economies such as the Netherlands.

As regards emigration of EU-17 citizens to the EU-27 and focusing again on the bigger flows, we can see in Figure A.2 that, symptomatic for the higher-income economies, emigration from Germany and the UK to other EU-27 economies were gradually increasing over the pre-crisis period, but then fell sharply in the wake of the crisis. The pattern is quite different and differentiated when we look at new member countries, taking the examples of Poland and Romania. Poland showed strong increases in emigration flows from the time of accession in 2004 until the crisis after which they dropped sharply and did not recover to pre-crisis levels (Poland is the example of a NMS which weathered the crisis well, without a recession). The pattern of Romania is quite different, as it experienced a dramatic jump in (recorded) emigration to other EU-27 economies when it became a full member of the EU in 2007, despite of transitory restrictions remaining in place with regard to full access to the labour market in many of the host economies. After 2007, migration flows from Romania (a country with much lower income levels than Poland) dipped somewhat but they remained on a high level.

Appendix Figures A.3-A.12 depict developments in other variables (real wage rates, productivity levels, activity rates, human capital index) in the OMS (old Member States) and NMS (new Member States) used in the analysis.

4. Methodology: a panel VAR approach

While VAR models are now well established and widely used in applied macroeconomics, panel VAR (henceforth, pVAR) models are still less common. Generally, the pVAR methodology was pioneered by Holtz-Eakin et al. (1988) to analyse the dynamic relationships between wages and hours worked among American males and has since then slowly found its way into applied macroeconomics. Generally, traditional VAR models and pVAR models are structurally similar: both assume that all variables in the system are endogenous and interdependent. However, in pVAR models, a cross-sectional dimension is added to the representation.

Generally, pVAR models take the following reduced form:

$$Y_{it} = \Gamma(L)Y_{it} + c_i + \varepsilon_{it}, \qquad \text{with } i = 1, \dots, N \text{ and } t = 1, \dots, T \tag{7}$$

where Y_{it} is a $Kx1$ vector of stationary variables, $\Gamma(L)Y_{it}$ is the KxK matrix of slope coefficients polynomial in the lag operator (L), while c_i refers to a $Kx1$ vector of unobservable fixed effects and ε_{it} is a $Kx1$ vector of idiosyncratic errors.

However, in such dynamic panels characterised by lagged dependent variables, fixed effects estimators are not consistent due to the correlation between the fixed effects and the lagged regressor, giving rise to the well-known 'dynamic panel bias' (see Nickell, 1981 or Anderson and Hsiao, 1982). Several remedies have been proposed in the literature to overcome the obvious endogeneity issue like the first-difference GMM estimator by Arellano and Bond (1991) or the system GMM estimator by Blundell and Bond (1998). However, as has been pointed out by Bond et al. (2001) first-difference based GMM procedures may behave poorly and also magnify prevailing data gaps. To tackle the potential dynamic panel bias and to ensure that prevailing data gaps are not magnified, the ensuing analysis uses the Helmert transformation, which expunges fixed effects by transforming all variables in the model into weighted deviations from forward means. This procedure then allows to use lagged variables as instruments and to estimate consistent coefficients by GMM. In particular, consider variable y_{it}^s in the vector $Y_{it} = (y_{it}^1, y_{it}^2, \dots, y_{it}^S)'$, where i is the group variable (e.g. country or region) and t is the time variable with $t \in \{1, 2, \dots, T\}$ with T referring to the last period of the available variable. Let $\bar{y}_{it}^s = \left(\frac{1}{T_i - 1}\right)\sum_{n=t+1}^{T_i} y_{in}^s$ denote the mean of all future values of variable y_{it}^s in the vector Y_{it}. Furthermore, let $\Theta_{it} = \sqrt{\frac{T_i - t}{T_i - t + 1}}$ denote the weights, which put stronger emphasis on observations closer to the beginning of the time series, guaranteeing that observations have equal variance. The Helmert transformation is then defined as follows:

$$\tilde{y}_{it}^s = \sqrt{\frac{T_i - t}{T_i - t + 1}}\left(y_{it}^s - \frac{1}{T_i - 1}\sum_{n=t+1}^{T_i} y_{in}^s\right) = \Theta_{it}(y_{it}^s - \bar{y}_{it}^s) \tag{8}$$

A similar transformation is also conducted for the error terms ε_{it}, ultimately transforming the reduced from model defined in equation (7) into the following general Helmert-transformed model:

$$\tilde{Y}_{it} = \Gamma(L)\tilde{Y}_{it} + \tilde{\varepsilon}_{it} \tag{9}$$

5. Results

5.1 ESTIMATION RESULTS

Estimation results of the pVAR(1) model for the EU as a whole as well as the NMS-to-OMS sample are presented in Table A.6 in the Appendix. Appendix Tables A.9 and A.10 present results from estimations when respectively either the relative real wage or the relative productivity variable are dropped in the estimation as these two variables are – as expected – highly correlated (see correlation matrix A.3). These alternative estimates are going to be used to check for robustness when applying the model estimates for analysing impulse-response functions (see section 6).

Moving to an interpretation of the estimation results obtained, we see that as regards the impact on net migration flows network effects are important determinants of net migration across countries, as high net migration in the past positively and significantly affects current net migration. A contracting/expanding wage differential (remember that the differentials are always defined in our analysis as the variable in the sending country minus the variable in the receiving country) between country i and j gives less robust results for net migration flows. The variable is weakly significant to explain NMS-to-OMS net migration flows, but not significant in affecting net migration flows for the EU as a whole. Similarly, the relative activity rate variables (capturing labour supply effects on net migration flows) becomes significant in explaining NMS-to-OMS migration flows – in the specification when the real wage variable is dropped but productivity level differences are kept in (see Table A.9) but it is not significant as an explanatory variable for net migration flows for the EU as a whole. Moving to the impact of differences in human capital endowments on net migration flows, we find that these are significant as an explanatory variable for net migration flows in the EU as a whole but not for NMS-to-OMS migration flows.

We shall not go over the details in interpreting the parameter estimates with regard to the determinants of the other labour market variables (real wage, productivity, activity rate and human capital stock differences) except to say that there are interesting differences in the estimates for the restricted NMS-to-OMS sample as compared to the EU patterns as a whole. These will be further interpreted when applying the models in the form of impulse-response functions below.

Overall, one can say that estimation results give a rather mixed picture of the relationships between labour mobility, on the one hand, and labour market indicators, on the other. In what follows, impulse response functions are going to be presented and discussed which more explicitly capture and reflect the complexity of the relationships between net migration and labour market conditions and outcomes.

5.2 IMPULSE RESPONSE FUNCTIONS

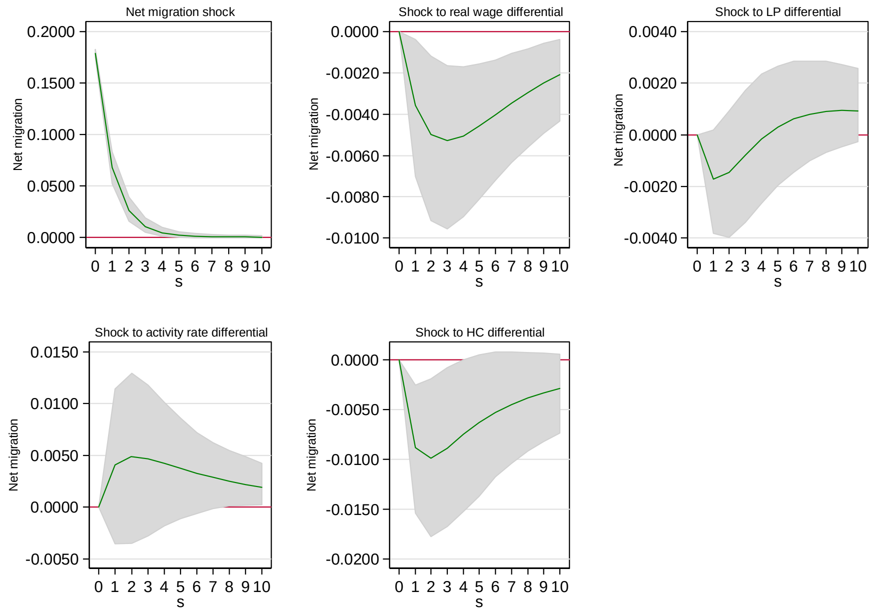
Two sets of impulse response functions (IRFs) are shown in Figures 1-2 and 3-4 respectively: the first set of figures (Figs. 1-2) shows the impact of a one-time positive shock (amounting to one standard deviation) to each of the labour market indicators (relative real wage rates, activity rates, labour productivity growth and human capital indicators[5]) on net migration flows plus the lagged effect of a shock of net migration flows on itself. The second set of figures (Figs. 3-4) shows the impact of a positive shock to net migration on the other labour market variables.

There are two sets of figures each, as we show first (Figs. 1 and 3) the IRFs including all bilateral relationships across the EU countries, and then (Figs. 2 and 4) the bilateral relationships between the NMS as countries of origin and the OMS as countries of destination.

The following are the results depicted in the Figures:

We start with the first set of figures (Figs. 1 and 2) which depicts the response of net migration flows to shocks in the labour market indicators in the destination country compared to the country of origin of the migrant: First, we find a persistent and significant effect of a **one-time shock of net migration flows on the level of migrant flows**, i.e. the net migrant flows do not reverse. This is true for both figures i.e. it characterises the impact of migration flows in the EU as a whole, as well as the flows between NMS and OMS. The impact of the shock fades away after about three to four periods i.e. years.

Figure 1 / Response of net migration to shocks in other determinants: total sample



Source: own calculations.
Note: The green line refers to the impulse response, the grey area to the 95% confidence interval around the estimates; errors are generated by Monte Carlo simulation with 1000 repetitions.

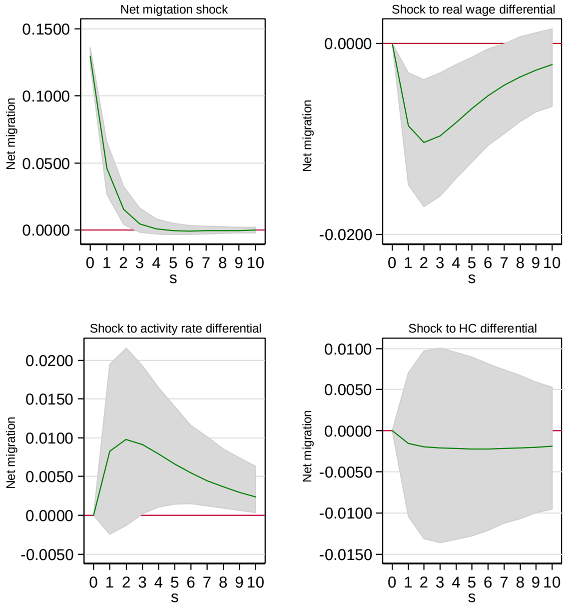
Next we come to the labour market indicators: we see that a positive shock in **relative real wage levels** between destination country and country of origin has significant effects (with the expected sign; remember that all differentials are defined as the value of the variable in the sending country minus the value of that variable in the receiving country) on net migration flows in both sets of inter-country

5 All variables have been specified in relative terms as values of the variable in the destination country relative to the values of the variable in the country of origin of the migrant.

relationships: however, it affects the sub-set of migration flows between NMS and OMS more strongly, which was also expected from the parameter estimates presented earlier in Table A.6.

We find no significant impacts of shocks to **relative labour productivity levels** in the country of destination relative to the country of origin in either of the two samples. We shall see later on in the robustness analysis (section 6), that taking account of the strong correlation between real wage and productivity differentials and dropping one of the variables, that the productivity variable will become significant and will show the expected sign.

Figure 2 / Response of net migration to shocks in other determinants: NMS-to-OMS sample only



Source: own calculations.
Note: The green line refers to the impulse response, the grey area to the 95% confidence interval around the estimates; errors are generated by Monte Carlo simulation with 1000 repetitions.

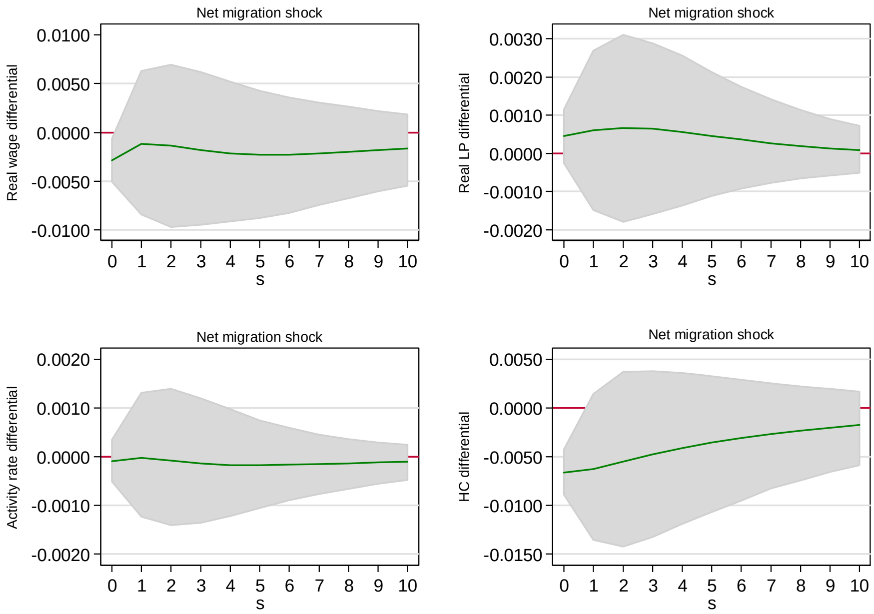
With regard to activity we observe a significant positive impact of increased **activity rates** in the country of origin relative to the country of destination which shows – in line with expectations – that an increase in the labour supply in origin countries and a reduction of the labour supply in the host economies (both through activity rates) both encourage net migration flows. This effect becomes significant only over a longer period of time for the EU as a whole, but happens earlier and lasts for an extended period in NMS-OMS relations. This means the migration flows react earlier and more forcefully to relative labour supply developments in the NMS-OMS interactions.

As regards the **human capital** indicator we observe a negative impact of an improvement in human capital in the sending country compared to the receiving country on net migration flows which confirms what we termed the H-O hypothesis. That is, convergence in human capital structures reduces the incentives for migration flows i.e. there is less complementarity in skill structures between potential migrants and the labour force of the potential host country. This effect is significant only for the EU sample as a whole, but does not impact on NMS-OMS migration flows. The reason for this could be, firstly, that human capital indicators – as we measure them, are quite similar between NMS and OMS and, secondly, that real wage differentials and labour supply effects are that much more important than differences in human capital/skill structures to explain NMS-OMS migration flows.

Next we come to the second set of figures (Figs. 3-4) which analyse impulse response functions in the other direction: from an impact of a one-time (one standard deviation) shock in migration flows on the labour market variables in the destination country relative to the country of origin:

For the sample as a whole, (Figure 3) we see hardly any significant effects. The only significant effect is the impact of net migration on human capital structures for the EU sample as a whole. The negative impact can be interpreted in two ways: net emigration reduces the human capital endowment in the sending country or/and increases the human capital endowment in the receiving country, both of which can be interpreted that migration favours skilled migrants but also that migration flows through labour market pressures might act as an incentive in the host country to improve skill levels of the domestic labour force.

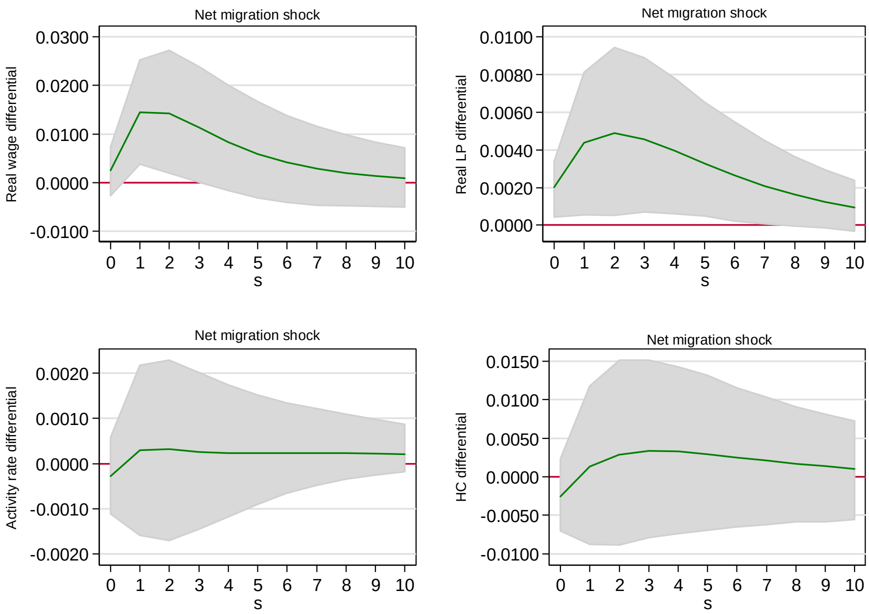
Figure 3 / Response of other determinants to shocks in net migration: total sample



Source: own calculations.
Note: The green line refers to the impulse response, the grey area to the 95% confidence interval around the estimates; errors are generated by Monte Carlo simulation with 1000 repetitions.

If we look at the effects of NMS-to-OMS migration (Figure 4) we see that there are significant effects both on the real wage and the productivity differentials. These can again be interpreted in two ways (as we only analyse the impact on the differential): either net emigration reduces the labour (supply) market pressure in the sending country thereby allowing an increase in the real wage there or/and the increased net immigration depresses the real wage in the country of destination. Thus one can say that in NMS-OMS relationships net migration contributes to real wage convergence.

Figure 4 / Response of other determinants to shocks in net migration: NMS-to-OMS sample only



Source: own calculations.
Note: The green line refers to the impulse response, the grey area to the 95% confidence interval around the estimates; errors are generated by Monte Carlo simulation with 1000 repetitions.

As regards the labour productivity effect, we can see that net migration has a protracted positive effect on productivity in the sending NMS country compared to the receiving OMS economies. This could be explained that net emigration would allow a reduction in employment levels (i.e. in 'labour hoarding') in sending countries without a reduction in output levels at the same time, while in receiving countries the average productivity impact of incoming migrants would be negative. This would be compatible with a below average productivity contribution of migrants which could in turn be interpreted to result from either lower skill levels of migrants than that of the domestic work force, or 'brain waste' i.e. migrants working in jobs below their skill levels, or simply by migrants adding to the work force in an economy with a downward sloping marginal productivity schedule.

We shall see later on (section 6) that the productivity effect in NMS-OMS relationships will not be robust, while the real wage effect remains significant. Furthermore, when dropping the productivity variable, other effects emerge, such as a significant effect on activity rates and on human capital structures (both of which will be discussed in section 6).

In conclusion we can say that we find quite distinct and interesting patterns of effects of labour market variables on migration flows and of migration flows on labour market structures when looking at NMS-to-OMS migration flows as against the pattern we observe for the EU as a whole.

5.3 VARIANCE DECOMPOSITION

While impulse response functions provide useful information about the effects of changes in a variable in response to a shock to another variable, they however fail to give information about how important such shocks are in explaining observable fluctuations in other variables. From a policy perspective, determining the relative importance of different shocks is of particular importance. Hence, in what follows, we perform a variance decomposition analysis to determine the relevance and importance of individual shocks for changes in our variables of interest. Results are reported separately for the overall sample (Table A.7 in the Appendix) as well as the NMS-to-OMS sample (Table A.8 in the Appendix) for two different time horizons: 5 periods after the shock as well as 10 years after the shock to account for the more long-term, cumulative effects of different shocks.

Results for the **overall sample** reported in Table A.7 point to two interesting findings: first, none of the relevant variables seems to play an important role for fluctuations in net migration; second, net migration itself also plays a negligible role for variations in other variables. More specifically, results highlight that net migration itself almost exclusively explains fluctuations in net migration, leaving virtually no role to other variables. The only notable exception is the human capital differential, which however, only explains about 1 per cent of fluctuations in net migration after 10 periods. Furthermore, net migration matters little for fluctuations in other variables. Again, the only notable exception is the human capital differential, whose fluctuations are partly explained – 1 per cent after 5 as well as 10 periods – by net migration.

A more diverse picture emerges for the remaining variables of interest. For instance, the human capital differential and the activity rate differential explain around 13 and 3 per cent, respectively, of fluctuations in wage differentials after 5 periods and even 20 and 6 per cent, respectively, after 10 periods. Furthermore, the wage differential is an important determinant of fluctuations in the real labour productivity differential, explaining around 17 and 21 per cent after 5 and 10 periods, respectively. On the contrary, fluctuations in the activity rate can be traced back to several relevant sources: the human capital differential, which explains up to 10 per cent of fluctuations after 10 periods as well as the real wage and labour productivity differentials, which both explain around 2 per cent of fluctuations after 10 periods. Changes of the human capital differential are to a large extent explained by the wage differential (14 per cent after 10 periods).

In contrast, results for the **NMS-to-OMS sample** reported in Table A.8 paint a less pronounced but nonetheless somewhat different picture: while fluctuations in net migration are again predominantly explained by net migration itself, other factors matter as well. Both, the real wage and the activity rate differentials are equally important and explain around 2 per cent of fluctuations in net migration after 10 periods. Hence, both the real wage and the activity rate differentials are relevant determinants for changes in net migration from NMS to OMS. Furthermore, net migration plays a stronger role for changes in other relevant variables and is particularly important for fluctuations in real labour productivity and real wage differentials, explaining 6 and 3 per cent, respectively, after 10 periods. This finding suggests that net migration from NMS to OMS is an important determinant of changes in both real labour productivity and real wage differentials.

As concerns the other variables of interest, somewhat similar patterns emerge, though the relative importance of some variables differs. For instance, relative to the overall sample, in the NMS-to-OMS sample, changes in the activity rate differentials are to a larger extent explained by the real wage differential but to a lesser extent explained by the human capital differential. Furthermore, the wage differential plays a stronger role for fluctuations in the human capital differential, explaining almost 20 per cent after 10 periods (while only around 14 per cent in the overall sample).

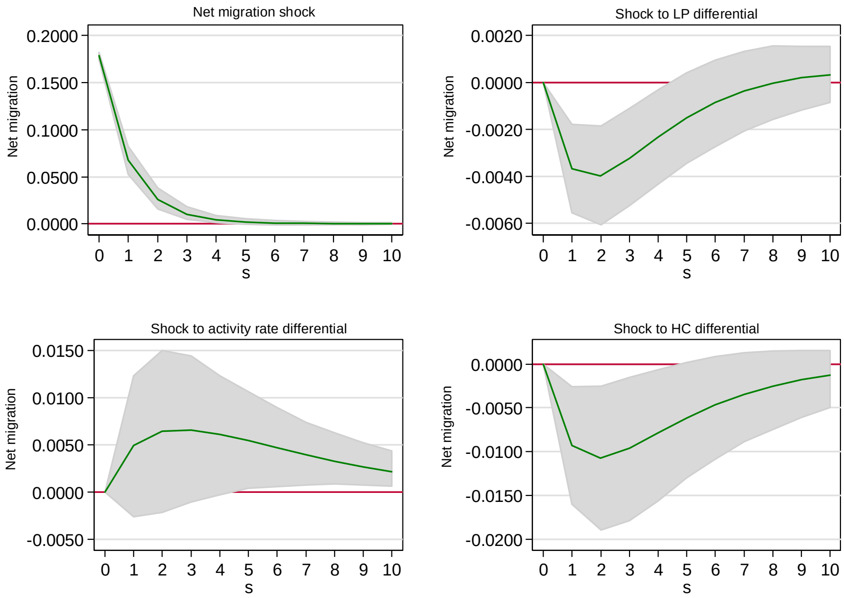
6. Robustness analysis

As expected and already mentioned earlier, there is considerable and significant correlation between real labour productivity differentials, on the one hand, and real wage differentials, on the other (see Appendix Table A.3). Hence, to avoid any distortive effects that may arise from substantial multi-collinearity between variables in the system, in what follows, a robustness analysis is undertaken. More specifically, real labour productivity differentials and real wage differentials are alternately dropped, giving rise to two alternative 4-variable pVAR(1)-systems. Section 6.1 presents and discusses IRFs if real wage differentials are dropped from the system while section 6.2 presents discusses IRFs if real labour productivity differentials are dropped from the system. Regression results for both alternative specifications are presented in Table A.9 and Table A.10 in the Appendix.

6.1 ROBUSTNESS ANALYSIS: EXCLUDING REAL WAGE-DIFFERENTIALS

Again, two different sets of figures are shown: the first set captures the impact of a one-time positive shock to each of the four remaining labour market indicators excluding real wage differentials plus net migration on net migration flows for the overall sample as well as the NMS-to-OMS sample (Figure 5 and 6); the second set of figures captures the effect of a one-time positive shock to net migration on the other labour market variables for both samples separately (Figures 7 and 8).

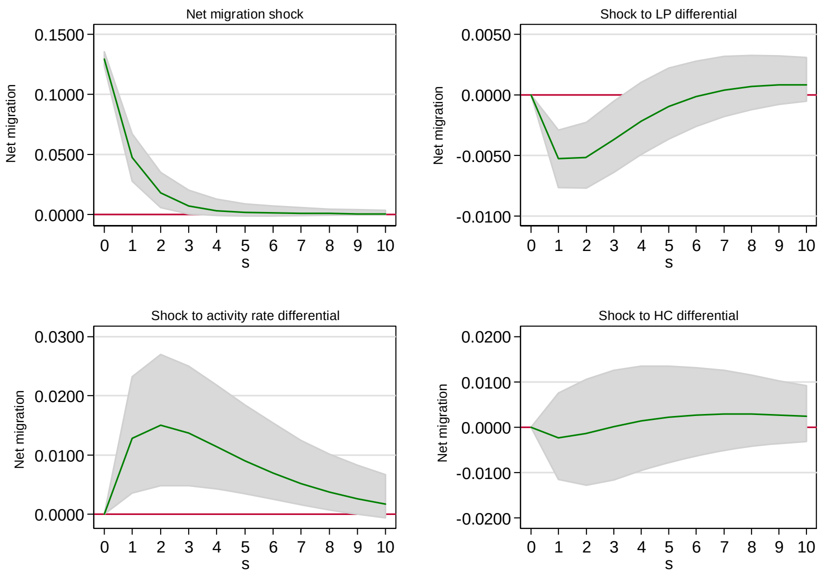
Figure 5 / Response of net migration to shocks in other determinants: total sample



Source: own calculations.
Note: The green line refers to the impulse response, the grey area to the 95% confidence interval around the estimates; errors are generated by Monte Carlo simulation with 1000 repetitions.

In line with above results, Figures 5 and 6 show the following robust effects: irrespective of country sample considered, there is robust evidence of a strong persistence effect of net migration. A one-time positive shock to net migration leads to a strong, significant and persistent effect on subsequent net migration. The overall effect disappears after around 3 to 4 periods following the impact of the shock. Likewise, similar effects are observable for shocks to the activity rate differential and the human capital differential, irrespective of sample considered. In particular, a positive one-time shock to the activity rate differential (i.e. an increase in activity rate of the sending country relative to that in the receiving country) has a positive and significant impact on net migration. The timing of the effect, however, differs by country sample: while the positive effect on migration takes some time to materialise in the overall sample, the impact is immediate for migration flows between NMS and OMS countries. Moreover, a positive one-time shock to the human capital differential has a significant negative effect on net migration for the EU as a whole but no significant effect on net migration between NMS and OMS countries, again a confirmation of the H-O hypothesis. For the EU as a whole, the effect dies out after around 5 periods.

Figure 6 / Response of net migration to shocks in other determinants: NMS-to-OMS sample only

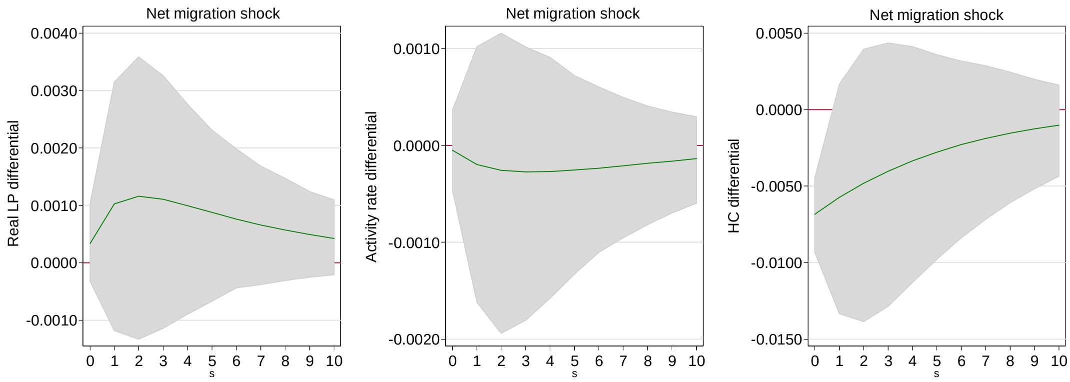


Source: own calculations.
Note: The green line refers to the impulse response, the grey area to the 95% confidence interval around the estimates; errors are generated by Monte Carlo simulation with 1000 repetitions.

In contrast to earlier results (when the real wage differential was kept as an additional variable), however, a one-time shock to the real labour productivity differential (i.e. productivity convergence) is shown to give rise to similar and significant effects in both samples of countries, leading to a significant and quite persistent drop in net migration in the EU as a whole as well as from NMS to OMS countries, although the effect is somewhat stronger in the latter case. This finding is consistent with the notion that net migration flows fall as a result of a drop in prevailing labour productivity gaps between sending and receiving countries.

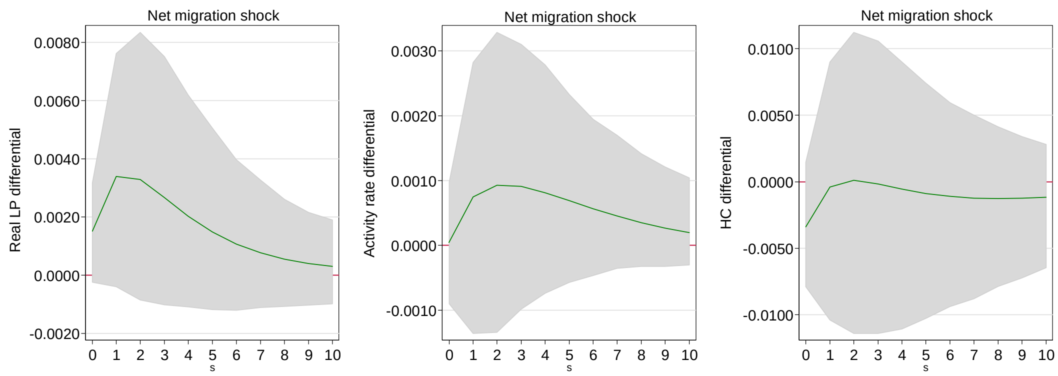
Effects of a one-time positive shock to net migration on the other labour market variables produces similar and therefore consistent results (see Figures 7 and 8): for the EU as a whole, a one-time shock to net migration has no significant effect on the real labour productivity differential, the activity rate differential or the human capital differential. By and large, this also applies to shocks to net migration between NMS and OMS countries: like before, no significant effects emerge on the activity rate differential or the human capital differential. However, in contrast to the earlier results, the effect on the real labour productivity differential is now insignificant also, highlighting that an increase in net migration between NMS and OMS countries does not impact on the prevailing real labour productivity differentials between NMS and OMS countries.

Figure 7 / Response of other determinants to shocks in net migration: total sample



Source: own calculations.
Note: The green line refers to the impulse response, the grey area to the 95% confidence interval around the estimates; errors are generated by Monte Carlo simulation with 1000 repetitions.

Figure 8 / Response of other determinants to shocks in net migration: NMS-to-OMS sample only



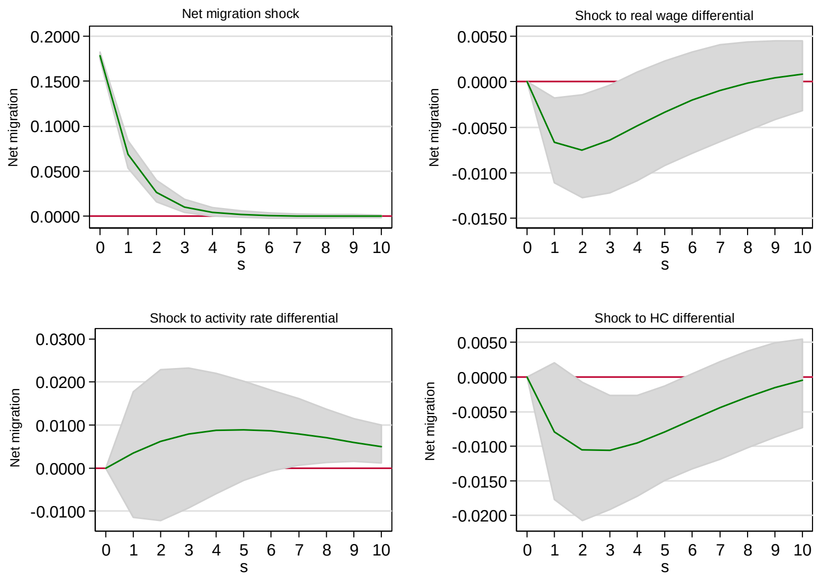
Source: own calculations.
Note: The green line refers to the impulse response, the grey area to the 95% confidence interval around the estimates; errors are generated by Monte Carlo simulation with 1000 repetitions.

6.2 ROBUSTNESS ANALYSIS: EXCLUDING REAL LABOUR PRODUCTIVITY DIFFERENTIALS

Figures 9 to 12 depict effects of one-time positive shocks if real labour productivity differentials are excluded from the system instead. Figures 9 and 10 show the effect of a one-time positive shock of the four remaining labour market indicators plus earlier net migration on net migration flows for the two samples separately, while Figures 11 and 12 capture the effect of a one-time positive shock to net migration on the other labour market variables for both samples separately.

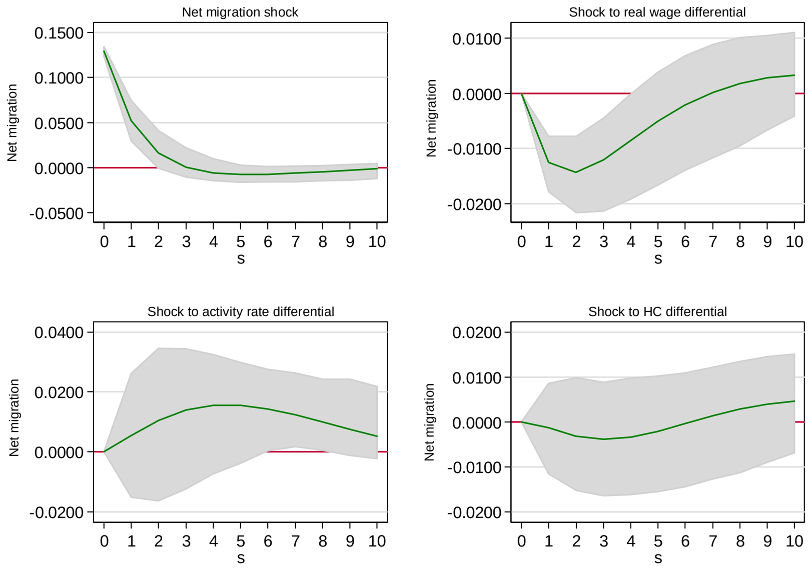
Figures 9 and 10 point to robust effects of a one-time positive shock to net migration on the remaining labour market variables. Hence, the exclusion of the real labour productivity differential leaves the main conclusions unaltered.

Figure 9 / Response of net migration to shocks in other determinants: total sample



Source: own calculations.
Note: The green line refers to the impulse response, the grey area to the 95% confidence interval around the estimates; errors are generated by Monte Carlo simulation with 1000 repetitions.

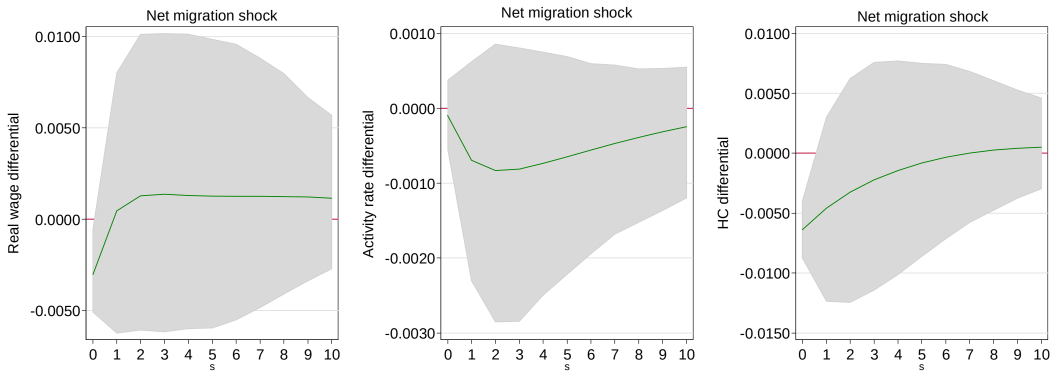
Figure 10 / Response of net migration to shocks in other determinants: NMS-to-OMS sample only



Source: own calculations.
Note: The green line refers to the impulse response, the grey area to the 95% confidence interval around the estimates; errors are generated by Monte Carlo simulation with 1000 repetitions.

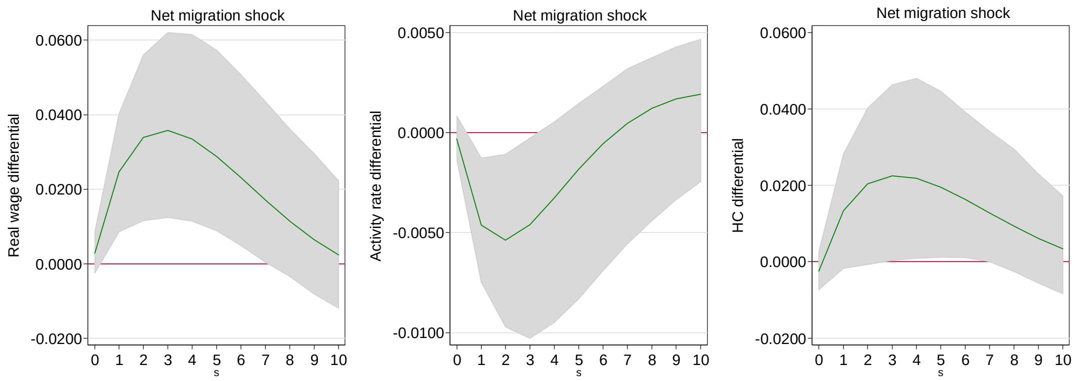
On the contrary, the exclusion of the real labour productivity differential produces partly different results, particularly for migration between NMS and OMS countries. More specifically, while findings are robust for shocks to net migration on other labour market variables for the EU as a whole (see Figures 11 and 12) somewhat different effects are observable for shocks to net migration between NMS and OMS countries. Our results show that a one-time positive shock to net migration between NMS and OMS countries has a significant negative, but short-term, effect on activity rate differentials. This means that either activity rates fall in the sending country or rise in the host country. The latter is the more likely effect as new cohorts of migrants have high activity rates and hence would lift the overall activity rate in the host country if not compensated by an induced fall of the inactivity rate by the existing labour force in these countries. Likewise, a one-time positive shock to net migration between NMS and OMS countries has a significant positive and more persistent effect on prevailing human capital differentials, suggesting that more intense net migration from NMS to OMS countries results in a reduction in human capital differentials, which is equivalent to a convergence of human capital endowments between NMS and OMS countries. Results remain robust for the effect on real wage differentials, highlighting that real wage differentials between NMS and OMS countries tend to converge in response to a one-time positive shock to net migration between these two sets of countries.

Figure 11 / Response of other determinants to shocks in net migration: total sample



Source: own calculations.
Note: The green line refers to the impulse response, the grey area to the 95% confidence interval around the estimates; errors are generated by Monte Carlo simulation with 1000 repetitions.

Figure 12 / Response of other determinants to shocks in net migration: NMS-to-OMS sample only



Source: own calculations.
Note: The green line refers to the impulse response, the grey area to the 95% confidence interval around the estimates; errors are generated by Monte Carlo simulation with 1000 repetitions.

7. The role of network effects – the stock of migrants by country of origin

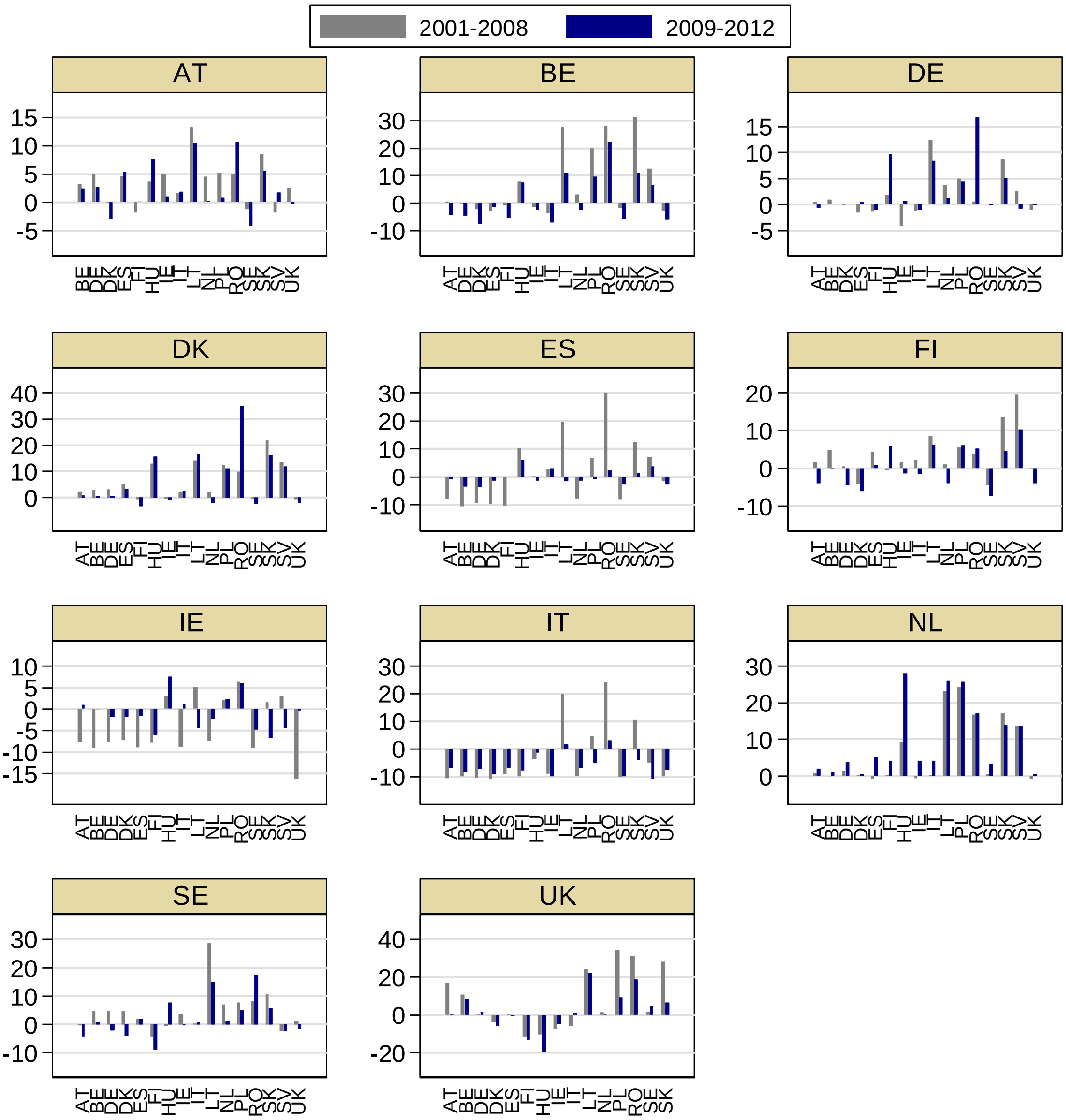
The model as estimated introduced the 'network effect' so far only in an aggregate manner, i.e. whether an earlier flow of migrants (in the aggregate) in a particular country affects subsequent migration flows. However, the literature also attempts to be more specific about such network effects (see the review in section 2) and examines whether a stock of migrants from a particular country of origin acts as an additional incentive for additional net migration flows from the same country of origin (as it reduces integration and search costs).

We have tested for such an additional 'country-of-origin specific network effect' by estimating a pVAR model with the share of migrants from a particular source country in the overall stock of migrants in the country of destination as the dependent variable. The model was estimated in differenced form as – given the presence of network effects – there was non-stationarity in the new variable in level terms. The results from the use of the estimated model in the form of impulse response functions are depicted in Appendix Figures A.13-A.18. The interesting feature which emerges from this analysis is again the difference in the results for the total sample of EU17 migration flows and when we limit the sample to the NMS-to-OMS flows. With the exception of the network variable itself which has a significant impact in both samples, i.e. an increase in the share of migrants from a particular country of origin also has a significant positive effect on the share increase in the following periods, the other variables have significant effects mostly only in the NMS-to-OMS sample. Even as regards the country-specific network effect the total sample shows only a very short-term effect, while in the NMS-to-OMS sample the effect is longer-lasting (4-5 years).

As regards the impact of the other variables which were tested for a significant impact on the increase in the share of a particular migrant group in the overall stock of migrants, we find robust positive effects for the NMS-to-OMS sample of relative real wages and productivity (in the sending country relative to the host country) and a negative impact of relative activity levels; the relative human capital variable turns out to be less robust and is negative. In the total sample – apart from the lagged country-specific network variable – only the relative human capital variable has a robust negative impact. Let us interpret these results: First, the hypothesis that an increase in the share of migrants from a particular country of origin in a particular country of destination has a positive impact on future increases in that share is confirmed, with longer-run impacts on NMS-to-OMS flows. As regards the other variables, the analysis indicates that if there is stronger real wage and productivity convergence (between sending NMS and host OMS country) this leads to a higher likelihood that the country-specific network effect intensifies. This might sound surprising, as one would expect that the push effect becomes weaker with such convergence; however, it could be that such convergence reduces further the integration costs which networks provide as convergence in productivity and real wages (between sending and host country) also indicates that these migrants will fit more easily into the work environment of the host country. The country-specific networks support the migrant in this endeavour. As regards the activity variable, this shows the usual 'push' effect in that migrants which face a deteriorating relative activity rate in the country of origin will have a stronger incentive to migrate.

At a descriptive level, it might be interesting for the reader to look at the pattern of share increases in the total stock of migrants coming from different EU source countries in the different countries of destination. The growth rates (in % per annum) over two periods (the pre-crisis period 2001-2008 and the crisis period 2009-2012) are depicted in Figures 13 and 14. They do show quite a differentiated picture, both as regards the country-to-country patterns of migrant stock developments between EU member countries as well as over the two different periods.

Figure 13 / Growth rates of the shares of migrants from a particular country of origin in total OMS host country migrant stock



Source: Eurostat: own calculations.

We let the reader looks at these patterns in detail and want to point only to a few interesting features specifically with respect to changes in trends during the crisis compared to the pre-crisis period:

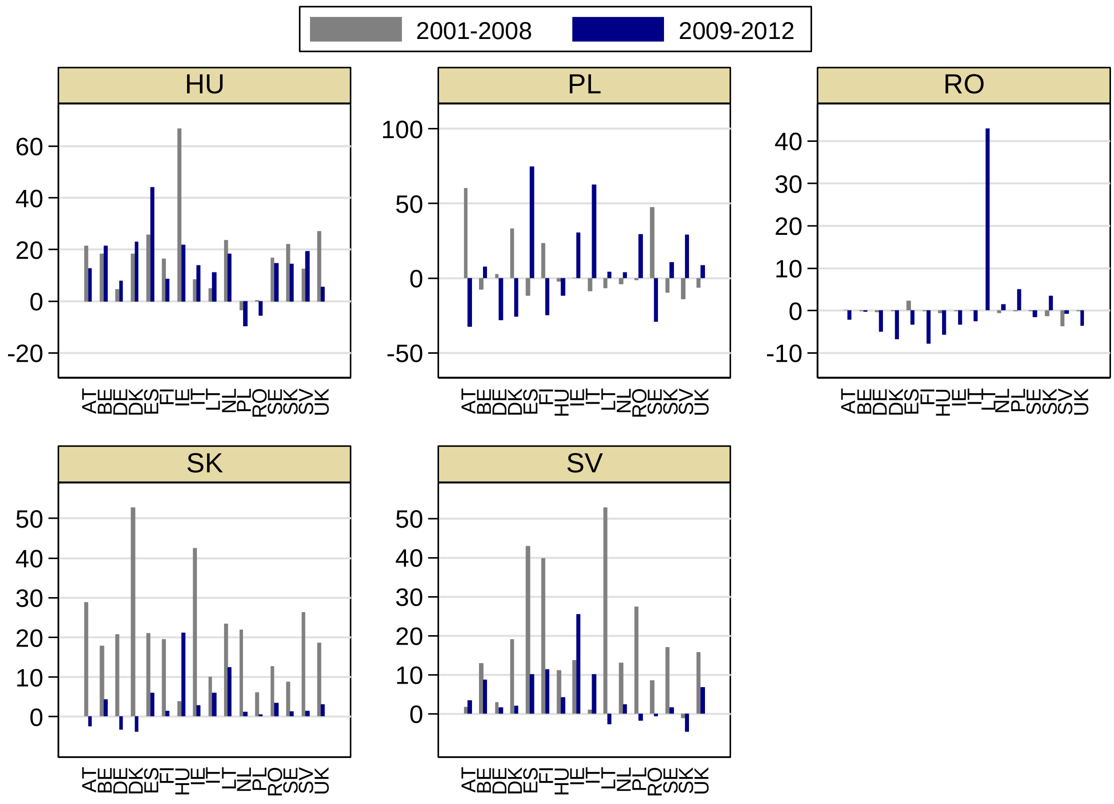
› What emerges quite clearly is the sharp drop of migrants from other EU economies in the overall stock of migrants in the Southern EU economies (Spain and Italy) during the crisis period while in the 'Northern' EU economies (Germany, Austria, Belgium, Denmark, Sweden) the share increases are holding up during the crisis.

› Quite visible are also the strong increases in the shares of Romanian and Hungarian migrants in the stock of migrants in some of the destination countries (Germany, Austria, Sweden, Denmark) during the crisis period. The former having to do with the late liberalised access to EU labour markets, the latter with a specifically bad economic situation in Hungary during the crisis.

› There is a sharp drop of the growth of the Polish migrants' share in the UK migrant stock over the crisis period which was a very preferred country of destination in the pre-crisis period (as it belonged to the few countries which liberalised labour market access for the 2004 wave of NMS at the earliest date), and also in some other countries but much less so in Germany which is now the main attractor country for CEE migrants.

› Lithuania, as representative of the Baltic countries in our sample, shows a fall in the growth of the share of its emigrants over the crisis-period in the migrants' stocks of EU countries but from very high rates in the pre-crisis period, very likely the result of a rebound of growth in the Baltic states after a very sharp fall of employment in the early phase of the crisis.

Figure 14 / Growth rates of the shares of migrants from a particular country of origin in total NMS host country migrant stock



Source: Eurostat: own calculations.
Note: No data are available for Lithuania; outlier-corrected average growth rates are shown.

8. Main findings and conclusions

In this paper we analysed intra-EU labour mobility patterns and labour market adjustments over the period 2000 to 2012. The period covers the first and second waves of Eastern enlargement in 2004 and 2007 and hence it was interesting to see whether these patterns had different characteristics when we look at intra-EU mobility as a whole or when we concentrate only on NMS-to-OMS mobility and its labour market determinants and, *vice versa*, labour market adjustments in the wake of intra-EU mobility. A detailed summary of the findings is provided in the *Executive Summary*. Here we want to highlight in particular the commonalities but also the interesting differences we found when analysing the pattern of intra-EU mobility as a whole (i.e. including in the sample all bilateral intra-EU flows with 17 EU economies included in the analysis) compared with the specific features of mobility patterns when only NMS-to-OMS flows are considered.

We start with **determinants of net migration flows**:

In general, we found robust evidence for both country samples with respect to '**network effects'**, i.e. high net migration in the past in a particular country of destination induces further net migration; this effect tends to decline over time. Apart from this general network effect, we also analysed **specific country-of-origin effects**, i.e. whether a larger stock of migrants from a particular source country has also a significant positive effect for the share of migrants from the same source country in the future. Here we found that this 'specific-network pull effect' is only very short-term (1-year) in the sample as a whole while it is more lasting (for a period of 4-5 years) in the case of NMS-to-OMS migration flows. This could result from the fact that NMS-to-OMS mobility is more recent and hence the advantage gained by migrants from specific country-of-origin networks in reducing migration and integration costs would be more important than for intra-EU mobility in general.

Another interesting feature of NMS-to-OMS flows which was not found for the sample as a whole, is that a process of **real wage and productivity convergence** (between the country of origin and the country of destination) tends to lead to an increase in the share of migrants from the specific country of origin. We interpret this in the way that such wage and productivity convergence would mean that migrants would then be used to more similar work environments (with more similar underlying skill requirements and skill supplies) in the two economies and this would make integration into labour markets and production environments easier than when gaps are widening.

For overall net migration flows, on the other hand, we found evidence for the traditionally expected relationships between **real wage and productivity gaps** and net migration flows: a reduction in real wage differentials between sending country and potential host country reduces net migration flows and the same is true for the impact of reduction in productivity gaps between host and origin country. That is a higher relative wage level in the country of origin increases the incentive to stay and, similarly, there is a stronger incentive to stay when relative productivity levels increase in the source country. This was found for both sets of samples.

As regards the impact of an increase in the **relative activity rates** (i.e. the share of the population which either has a job or is looking for a job) in the country-of-origin relative to the country-of-destination, we found significant effects in both samples. However, while that effect showed up only with a relatively long lag (5 to 7 years after the 'shock') in the total sample, it materialised more quickly in the NMS-to-OMS sample. We interpret this effect in the following way: as potential labour supply (linked to activity rates) declines in the potential country-of-destination or increases in the potential source county, there would be a stronger incentive by migrant workers to satisfy labour demand in the destination country and there would also be a higher chance that job search by migrants would be successful.

Let us now discuss the other set of results where we estimated the **impact of net migration flows on the other variables** considered in this study:

In this case, most relationships of significance were found for the NMS-to-OMS sample but not for the sample including all EU bilateral flows: thus we found a significant impact of net migration flows on **reducing real wage differentials** between NMS and OMS countries. This confirms the potential role which mobility can play in reducing labour market disequilibria in an integrated market environment (Borjas' (2001) 'greasing of the wheel' effect). As regards the impact of net migration flows **on real productivity differentials** between host and source country, we found a temporary impact of net migration flows towards reducing such gaps (i.e. either reducing the productivity levels in the OMS country or increasing it in the NMS country). The temporariness of this effect points to an adjustment process that needs to take place when a wave of foreign workers get absorbed in the production processes of the receiving country, thus reducing temporarily its level of productivity.

Another specific NMS-to-OMS effect was found with respect to the impact of net migration flows **on activity rates**: such flows increase the activity rates in the receiving country relative to the sending country. This is likely due to a compositional effect of recent cohorts of migrants showing high activity rates (due partly to age composition and the need to work for a living) and thus affecting the aggregate activity rate in the receiving county in a positive direction. Alternatively, it could have a negative impact on activity rates in the sending country as the more employment-searching individuals (also partly due to their age-composition) might leave the country.

Finally, there was also a case where the significance of tested relationships went the other way, i.e. significant for the sample as a whole but not for the NMS-to-OMS sample, and this was with respect to the differences in **human capital** (proxied in our analysis by a composite human capital index). Here we found a positive impact of net migration on the human capital index of the host economy relative to the sending economy. This can be interpreted either as evidence for relatively skilled migration (in composition) or an induced effect of an incentive to up-grade the human capital structures to the population at large in the host economies in the light of actual or expected migration from other EU economies. As regards the impact of human capital differences on net migration flows, there we found that reductions of such differences would reduce the incentive to migrate. This was also significant for the sample as a whole but not for the NMS-to-OMS sample. In that sample the human capital differences do not seem to be significant drivers of net migration flows, while other factors (real wage, productivity and activity rate differences) were.

Thus the paper was able to show interesting features of determinants of mobility patterns, on the one hand, and of the impact of net migration flows on other variables, on the other hand. Furthermore, the estimates also revealed significant differences in the results obtained for a larger sample of EU economies as compared to the specific case of NMS-to-OMS mobility flows.

9. References

Aghion, P. and P. Howitt (1992), 'A model of growth through creative destruction', Econometrica 60 (2), 323-351.

Anderson, T.W. and C. Hsiao (1982), 'Formulation and Estimation of Dynamic Models Using Panel Data', Journal of Econometrics, 18, 47-82.

Arellano, M. and S. Bond (1991), 'Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations', Review of Economic Studies, 58, 277–297.

Belot, M.V.K. and T.J. Hatton (2012), 'Immigrant Selection in the OECD', The Scandinavian Journal of Economics, 114(4), 1105-1128.

Beine, M., F. Docquier and H. Rapoport (2008), 'Brain drain and human capital formation in developing countries: winners and losers', The Economic Journal, 118, 631-652.

Bertoli, S. and J. Fernández-Huertas Moraga (2011), 'Multilateral Resistance to Migration', IZA Discussion Paper No. 5958.

Blundell, R. and S. Bond (1998), 'Initial conditions and moment restrictions in dynamic panel data models', Journal of Econometrics, 87, 115–143.

Bond, S., A. Hoeffler and J. Temple (2001), 'GMM estimation of empirical growth models', CEPR Discussion Paper No. 3048.

Bonin, H., W. Eichhorst, C. Florman, M.O. Hansen, L. Skiöld, J. Stuhler, K. Tatsiramos, H. Thomasen and K. F. Zimmermann (2008), 'Geographic Mobility in the European Union: Optimising its Economic and Social Benefits', IZA Research Report No. 19.

Borjas, G. J. (2005), 'The Labor Market Impact of High-Skill Immigration', NBER Working Paper 11217 Cambridge Massachusetts.

Borjas, G., (2001), 'Does Immigration Grease the Wheels of the Labor Market?', Brookings Papers on Economic Activity, 1:2001, 1-51.

Borjas, G. J. (1999), 'Immigration and Welfare Magnets', Journal of labor economics, 17 (4), 607-637.

Borjas, G. J. (1995), 'The Economic Benefits from Immigration', The Journal of Economic Perspectives, 9(2), 3-22.

Borjas, G. J. (1991) 'Immigration and Self-Selection', in Immigration, Trade, and the Labor Market, edited by John M. Abowd and Richard B. Freeman, Chicago: Univ. Chicago Press.

Borjas, G. J. (1987), 'Self-selection and the earnings of immigrants', American Economic Review, 77, 531-553.

Bosetti, V., C. Cattaneo and E. Verdolini (2015), 'Migration of skilled workers and innovation: A European Perspective', Journal of International Economics, 96, 311-322.

Boubtane, E., J.-C. Dumont and C. Rault (2014), 'Immigration and Economic Growth in the OECD Countries, 1986-2006', IZA Discussion Paper No. 8681.

Brücker, H. and C. Defoort (2006), 'The (Self-)Selection of International Migrants Reconsidered: Theory and New Evidence', IZA Discussion Paper No. 2052.

Chiang, Y., E. C. Hunnum and G. Kao (2013), 'It's Not Just About the Money: Motivations for Youth Migration in Rural China', Asia-Pacific Education, Language Minorities and Migration (ELMM) Network Working Paper Series No. 2-18-2013.

Chiswick, C. U., B. R. Chiswick and G. Karras (1992), 'The Impact of Immigration on the Macroeconomy', Carnegie-Rochester Conference Series on Public Policy, 37, 279-316.

Chiswick, B. R. (1998), 'The Economic Consequences of Immigration: Application to the United States and Japan', in: M. Weiner and T. Hanami (eds.), Temporary Workers or Future Citizens? Japanese and U.S. Migration Policies, New York: New York University Press, 177-208.

Clark, X., T. Hatton and J. Williamson (2007), 'Explaining U.S. immigration, 1971-1998,' Review of Economics and Statistics, 89(2), 359-373.

Day, K. M. (1992), 'Interprovincial Migration and Local Public Goods', The Canadian Journal of Economics, 25(1), 123-144.

Di Maria, C. and E. Lazarova (2009), 'Migration, Human Capital Formation and Growth: an Empirical Investigation', World Development, 40(5), 938-955.

Docquier, F. and H. Rapoport (2012), 'Globalization, Brain Drain, and Development', Journal of Economic Literature, 50(3), 681-730.

Docquier, F. and H. Rapoport (2006), 'The brain drain', a new entry for the new Palgrave dictionary of economics, Second edition.

Dustmann, C. and T. Frattini (2008), 'The Fiscal Effects of Immigration to the UK', Centre for Research and Analysis of Migration Discussion Paper No. 22/13.

Favell, A. (2008), 'The New Face of East-West Migration in Europe', Journal of Ethnic and Migration Studies, 34(5), 701-716.

Feliciano, C. (2005), 'Educational Selectivity in U.S. Immigration: How Do Immigrants Compare to those left behind?', Demography, 42(1), 131-152.

Giulietti, C. and J. Wahba (2012), 'Welfare Migration', IZA Discussion Paper No. 6450.

Gross, D. M. and N. Schmitt (2012) 'Low- and high-skill migration flows: free mobility versus other determinants', Applied Economics, 44, 1-20.

Grossman, A. and E. Helpman (1991), 'Quality ladders in the theory of growth', Review of Economic Studies, 58 (1), 43–61.

Gustaffsson, B. and T. Österberg (2001), 'Immigrants and the public sector budget – accounting exercises for Sweden', Journal of Population Economics, 14(4), 689-708.

Harris, J. and M. P. Todaro (1970), 'Migration, Unemployment and Development: A Two-Sector Analysis', American Economic Review, 60 (1), 126–142.

Hatton, T. J. and M. Tani (2005), 'Immigration and inter-regional mobility in the UK, 1982–2000', Economic Journal, 115, F342–F358.

Hatton, T. J. and J. G. Williamson (2002), 'What fundamentals drive world migration?', NBER Paper No. 9159.

Hatton, T. J. and J. G. Williamson (2008), 'Global Migration and the World Economy: Two Centuries of Policy and Performance', The MIT Press.

Hatton, T. J. and J. G. Williamson (1998), 'The Age of Mass Migration: Causes and Economic Impact', New York, Oxford: Oxford University Press.

Hatton, T. J. and J. G. Williamson (1994), 'Migration and the International Labor Market 1850-1939', London: Routledge Chapman & Hall.

Hicks, J. (1932), 'The Theory of Wages', London: McMillan.

Hierländer, R., P. Huber, A. Iara, M. Landesmann, K. Nowotny, M. O'Mahony, F. Peng, C. Robinson and R. Stehrer (2010), 'Migration, Skills and Productivity', wiiw Research Report No. 365, The Vienna Institute for International Economic Studies, Vienna.

Holtz-Eakin, D., W. Newey and H. S. Rosen (1988), 'Estimating Vector Autoregressions with Panel Data', Econometrica, 56(6), 1371-1395.

Hunt, J. (2012), 'The Impact of Immigration on the Educational Attainment of Natives', NBER Working Paper 18047.

Hunt, J. and M. Gauthier-Loiselle (2010), 'How much does immigration boost innovation?', American Economic Journal: Macroeconomics, 2(2), 31-56.

Islam, A. (2007), 'Immigration Unemployment Relationship: The Evidence from Canada', Australian Economic Papers, 46(1), 52-66.

Kahanec, M. and K.F. Zimmermann (2009), 'Migration in an enlarged EU: A challenging solution?', Economic Papers 363.

Kerr, S. P. and W. R. Kerr (2009), 'Economic Impacts of Immigration: A Survey', Harvard Business School Working Paper No. 09-013.

Kerr, W.R. and W.F. Lincoln (2010), 'The Supply Side of Innovation: H-1B Visa Reforms and U.S. Ethnic Invention', Journal of Labor Economics, 28(3), 473-508.

King, R. (2002), 'Towards a New Map of European Migration', International Journal of Population Geography, 8, 89-106.

Massey, D. and M. Aysa (2005), 'Social capital and international migration from Latin America', Paper presented at the Expert Group Meeting on international migration and development in Latin America and the Caribbean, Population Division Department of Economic and Social Affairs United Nations Secretariat, Mexico City, 30 November – 2 December 2005

Massey, D., J. Arango, G. Hugo, A. Kouaouci, A. Pellegrino and J. E. Taylor (1998), Worlds in Motion: Understanding International Migration at the End of the Millennium, Oxford University Press.

Mayda, A. M. (2010), 'International migration: a panel data analysis of the determinants of bilateral flows', Journal of Population Economics, 23, 1249-1274.

McHenry, P. (2015), 'Immigration and the Human Capital of Natives', Journal of Human Resources, 50(1), 34-71.

Millington, J. (2000), 'Migration and Age: The Effect of Age on Sensitivity to Migration Stimuli', Regional Studies, 34(6), 521-533.

Mitze,T., B. Alecke and G. Untiedt (2012),' A Panel VAR Approach for Internal Migration, Modelling and Regional Labor Market Dynamics in Germany', Empirical Modelling in Regional Science, Lecture Notes in Economics and Mathematical Systems 657, Springer-Verlag, Berlin.

Nickell, S. (1981), 'Biases in Dynamic Models with Fixed Effects', Econometrica, 49, 1399-1416.

Nieburg, A. (2009), 'Migration and innovation: Does cultural diversity matter for regional R&D activity?', Papers in Regional Science, 89(3), 563-585.

Ortega, F. and G. Peri (2009), 'The Causes and Effects of International Migrations: Evidence from OECD Countries 1980-2005,' NBER Working Paper No. 14883, National Bureau of Economic Research.

Ozgen, C., P. Nijkamp, P. and J. Poot (2011), 'Immigration and innovation in European regions', IZA Discussion Paper 5676.

Partridge, M. D. and D. S. Rickman (2003), 'The waxing and waning of regional economics: the chicken-egg question of jobs versus people', Journal of Urban Economics, 53(2003), 76-97.

Pope, D. and G. Withers (1985), 'Immigration and Unemployment', Economic Record, 61(2), 554-563.

Pedersen, P. J., M. Pytlikova and N. Smith (2008), 'Selection and network effects—Migration flows into OECD countries 1990-2000', European Economic Review, 52, 1160-1186.

Peri, G. (2012), 'The Effect of Immigration on Productivity: Evidence from U.S. States', The Review of Economics and Statistics, 94(1), 348-358.

Regets, M. C. (2001), 'Research and Policy Issues in High-Skilled International Migration: A Perspective with Data from the United States', IZA Discussion Paper No. 366.

Rowthorn, R. (2008), 'The fiscal impacts of immigration on advanced economies', Oxford Review of Economic Policy, 24(3), 560-580.

Sjaastad, L. A. (1962), 'The Costs and Returns of Human Migration', The Journal of Political Economy, 70, 80-93.

Smith, A. (1776[1937]), 'An inquiry into the nature and causes of the wealth of nations', New York: Modern Library.

Solow, R. (1957), 'Technical change and the aggregate production function', Review of Economics and Statistics 39 (3), 312-320.

Stark, O., C. Helmenstein and A. Prskawetz (1998), ' Human capital depletion, human capital formation, and migration: a blessing or a ''curse''?', Economics Letters, 60, 363-367.

Stolz, Y. and J. Baten (2012), 'Brain Drain in the Age of Mass Migration: Does Relative Inequality Explain Migrant Selectivity?', CESifo Working Paper No. 3705.

Storesletten, K. (2003), 'Fiscal implications of immigration – a net present value approach', Scandinavian Journal of Economics, 105(3), 487-506.

Storesletten, K. (2000), 'Sustaining fiscal policy through immigration', Journal of Political Economy, 108(2), 300-323.

Todaro, M. (1969), 'A model of labour migration and urban unemployment in less developed countries', American Economic Review, 59, 138–148.

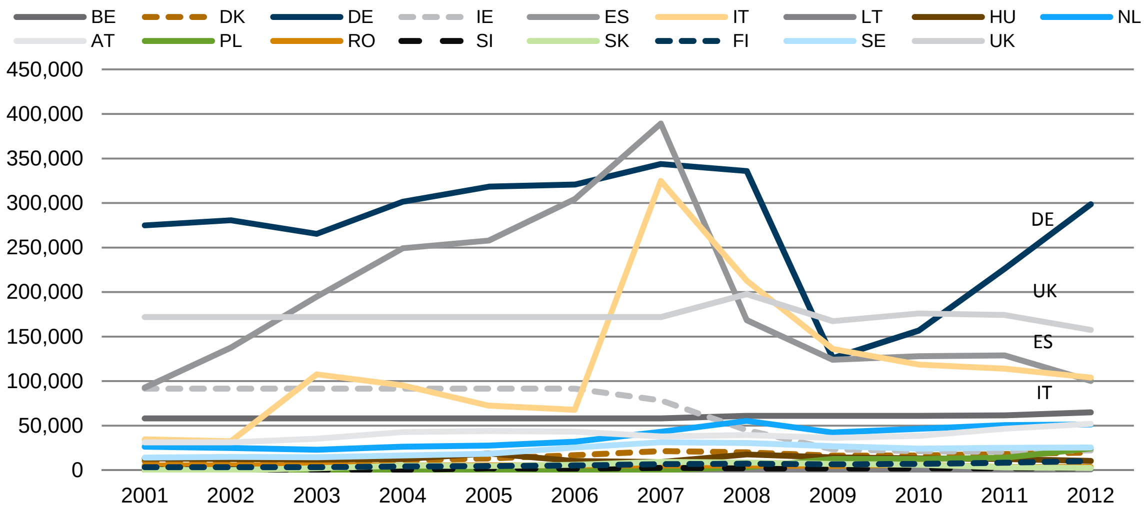
Todaro, M. (1976), 'Internal migration in developing countries', Geneva: International Labour Organization.

Vidal, J.-P. (1998), 'The effect of emigration on human capital formation', J Population Economics, 11, 589-600.

Zimmermann, K. F. (2005), 'European Migration: What Do We Know?', New York: Oxford University Press.

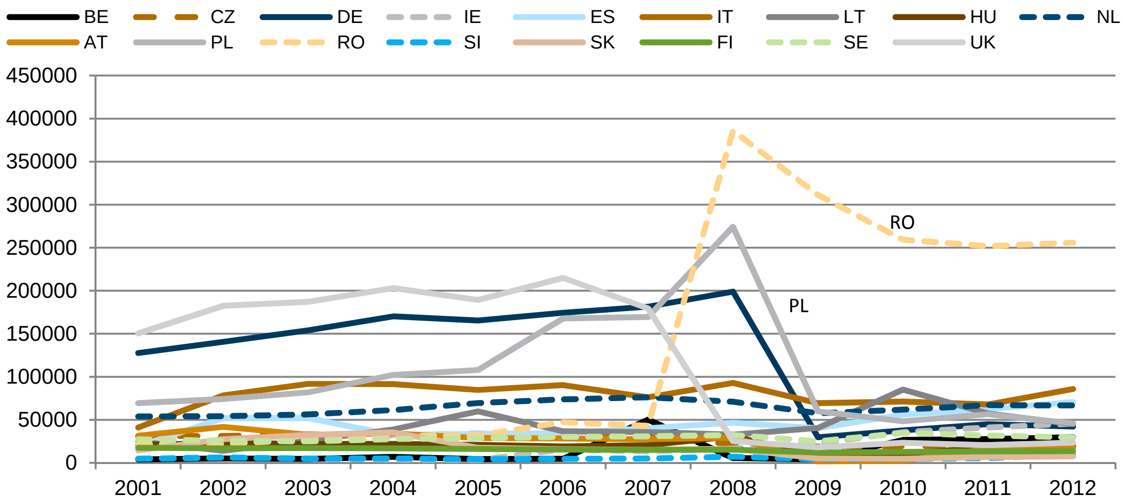
10. Appendix

Figure A 1 / Immigration[6] of EU-27 to EU-17 (2001-2012)



Source: Eurostat Statistics (Immigration by year and citizenship), own calculations.

Figure A 2 / Emigration[7] of EU-17 to EU-27 (2001-2012)

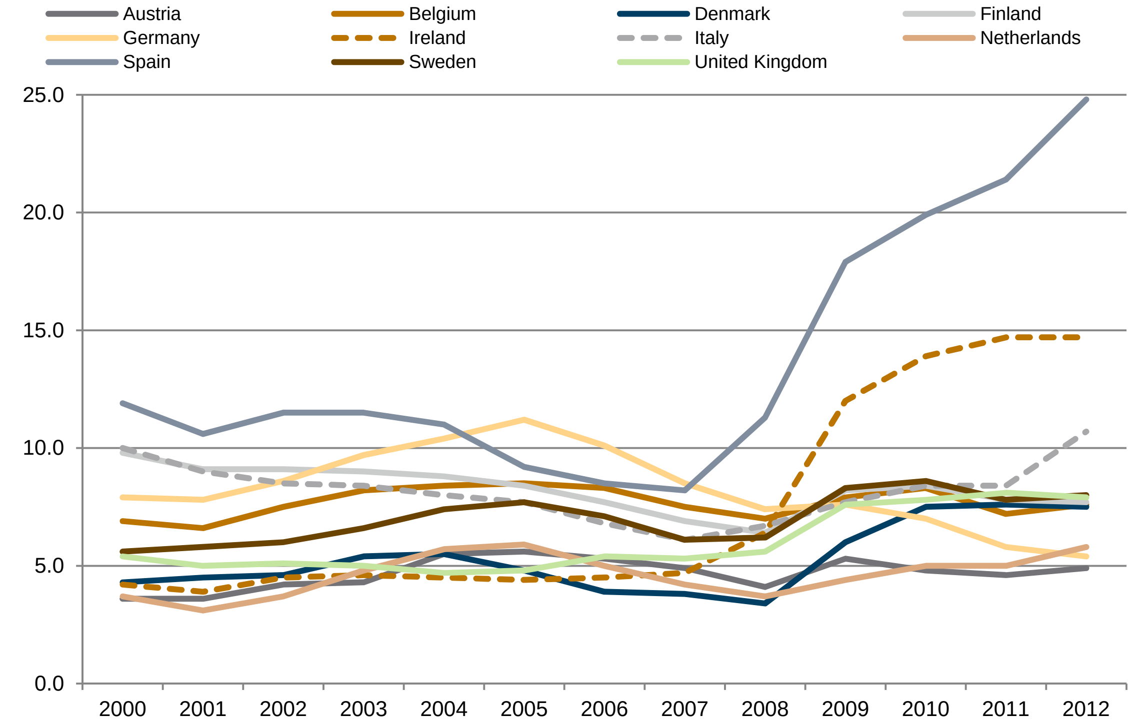


Source: Eurostat Statistics (emigration by year and citizenship), own calculations.

[6] According to Eurostat 'Immigration' denotes the action by which a person establishes his or her usual residence in the territory of a Member State for a period that is, or is expected to be, of at least 12 months, having previously been usually resident in another Member State or a third country;

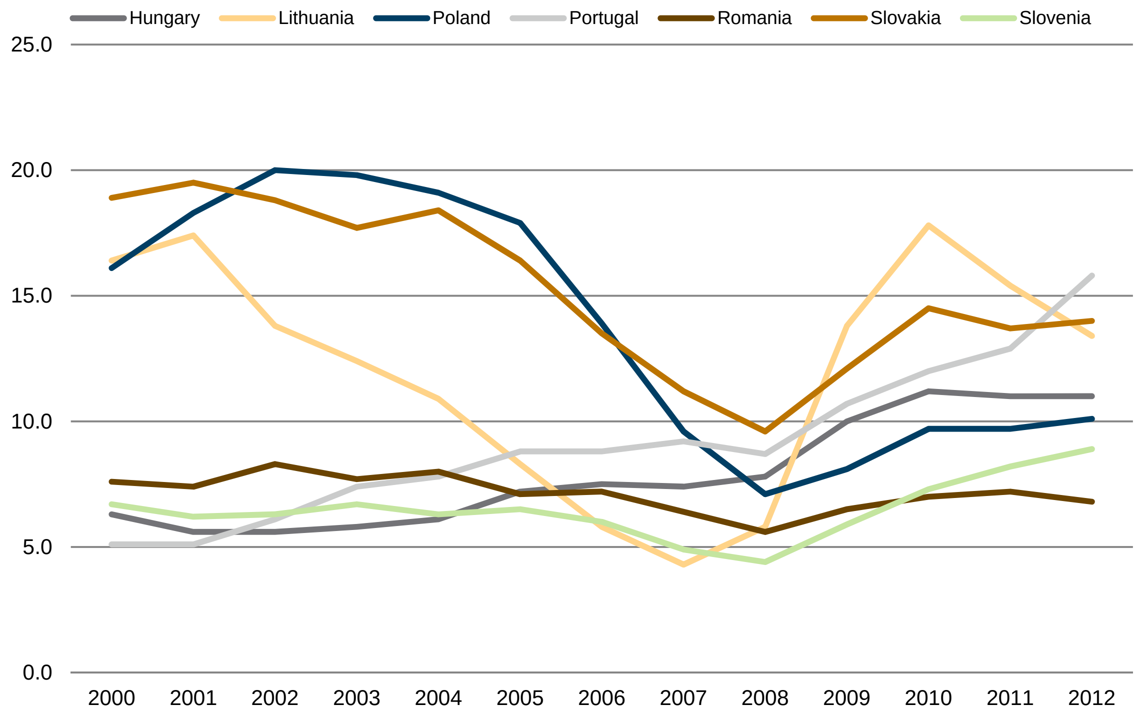
[7] According to Eurostat *'Emigration' denotes the action by which a person, having previously been usually resident in the territory of a Member State, ceases to have his or her usual residence in that Member State for a period that is, or is expected to be, of at least 12 months;.*

Figure A 3 / Unemployment rates: OMS



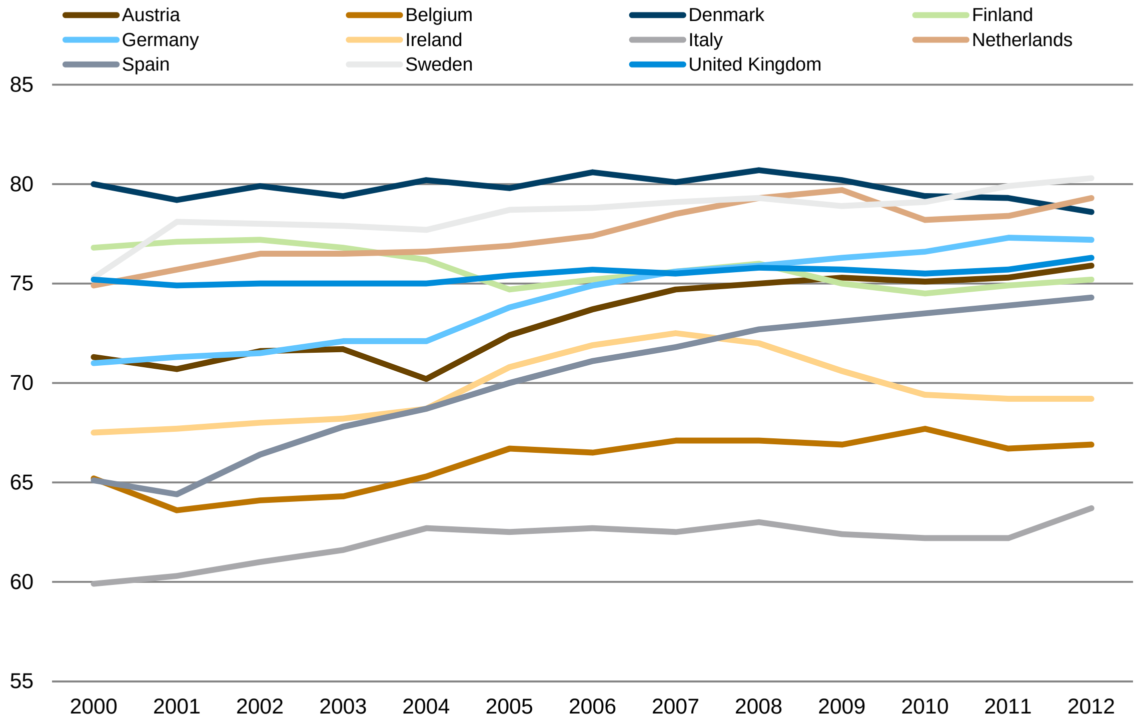
Source: Eurostat and wiiw Statistics, own calculations.

Figure A 4 / Unemployment rates: NMS



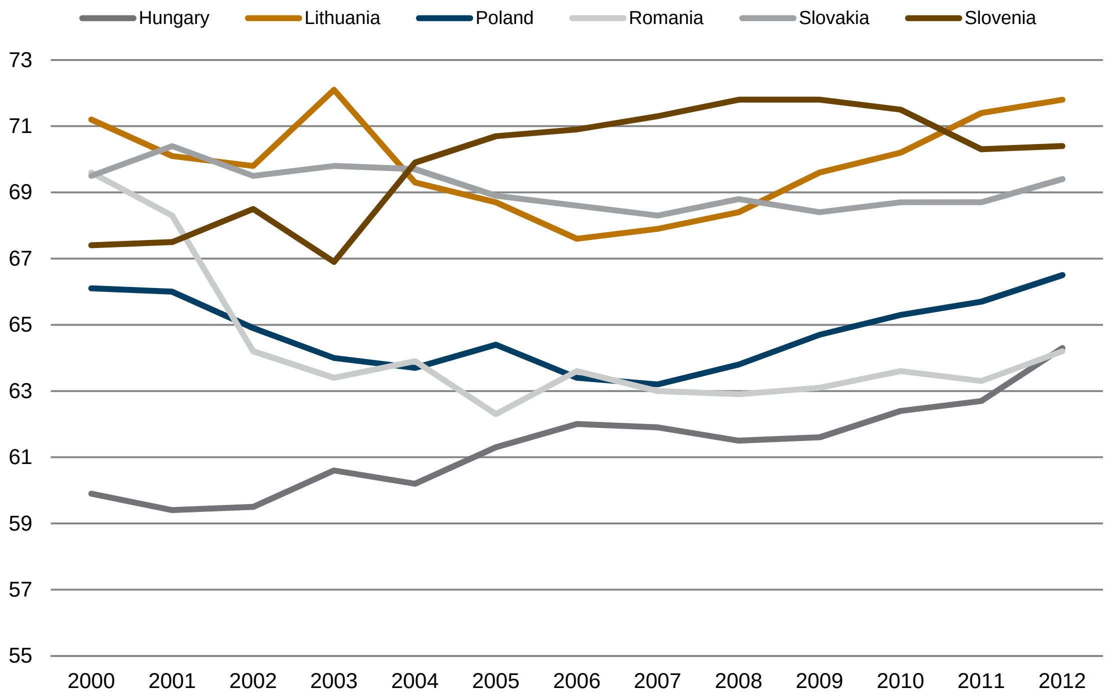
Source: Eurostat and wiiw Statistics, own calculations.

Figure A 5 / Activity rates: OMS



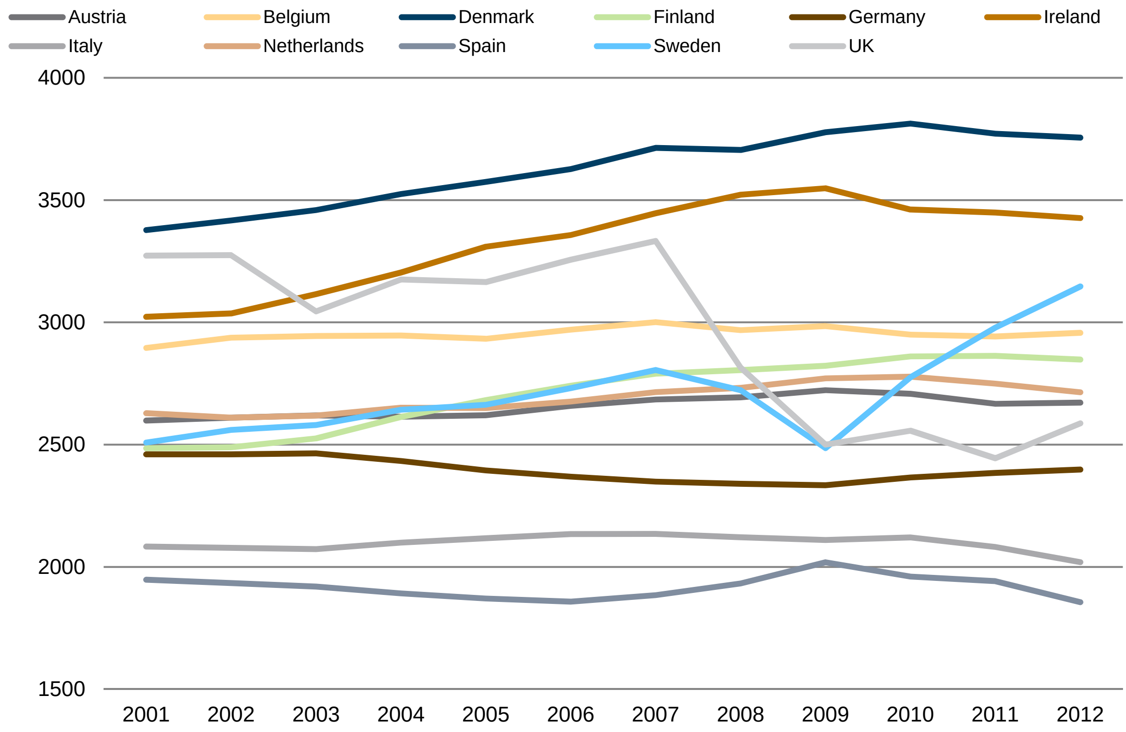
Source: Eurostat and wiiw Statistics, own calculations.

Figure A 6 / Activity rates: NMS



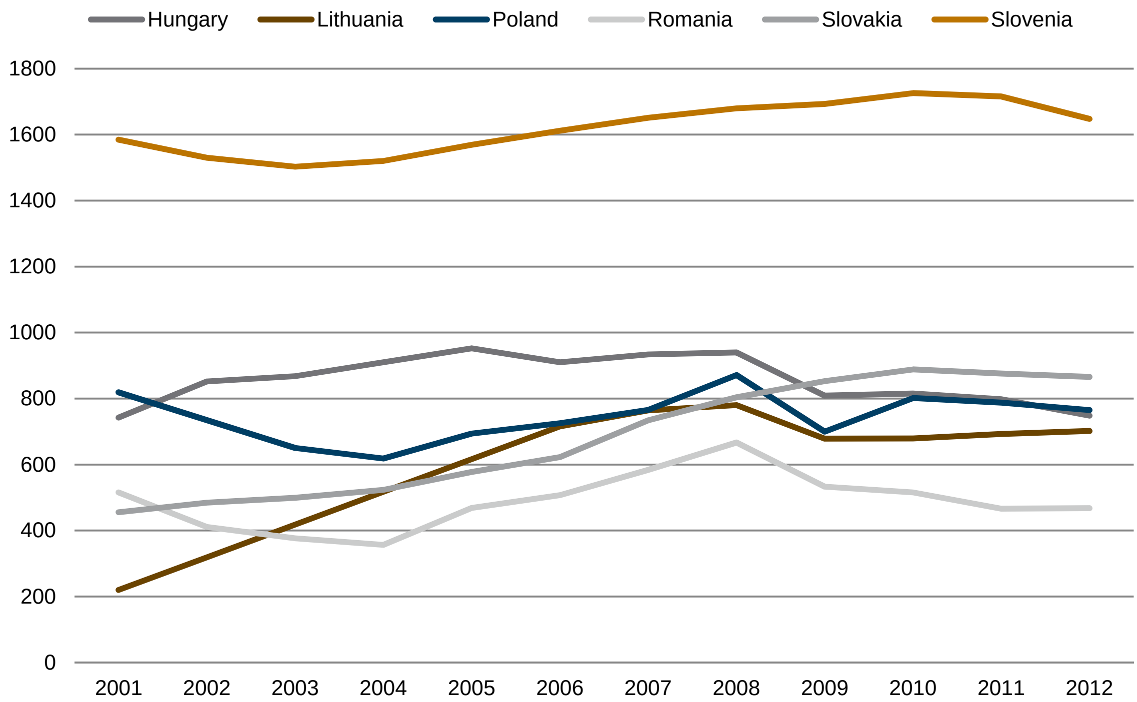
Source: Eurostat and wiiw Statistics, own calculations.

Figure A 7 / Real wages and salaries: OMS (CPI-deflated, in 2010 prices)



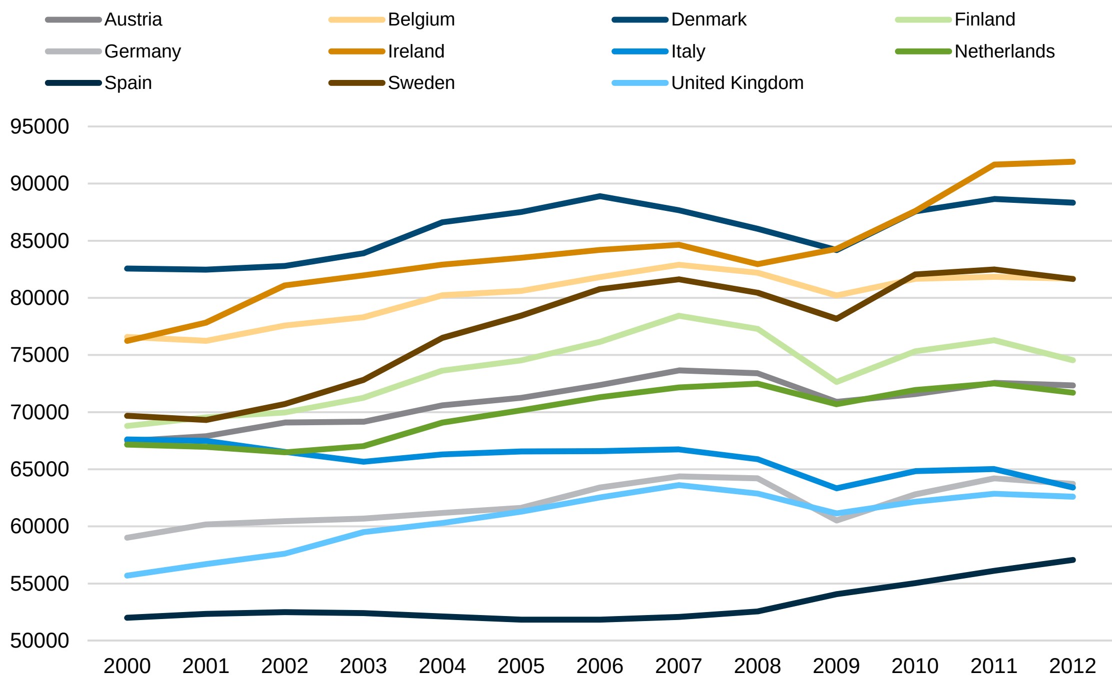
Source: wiiw Statistics, own calculations.

Figure A 8 / Real wages and salaries: NMS (CPI-deflated, in 2010 prices)



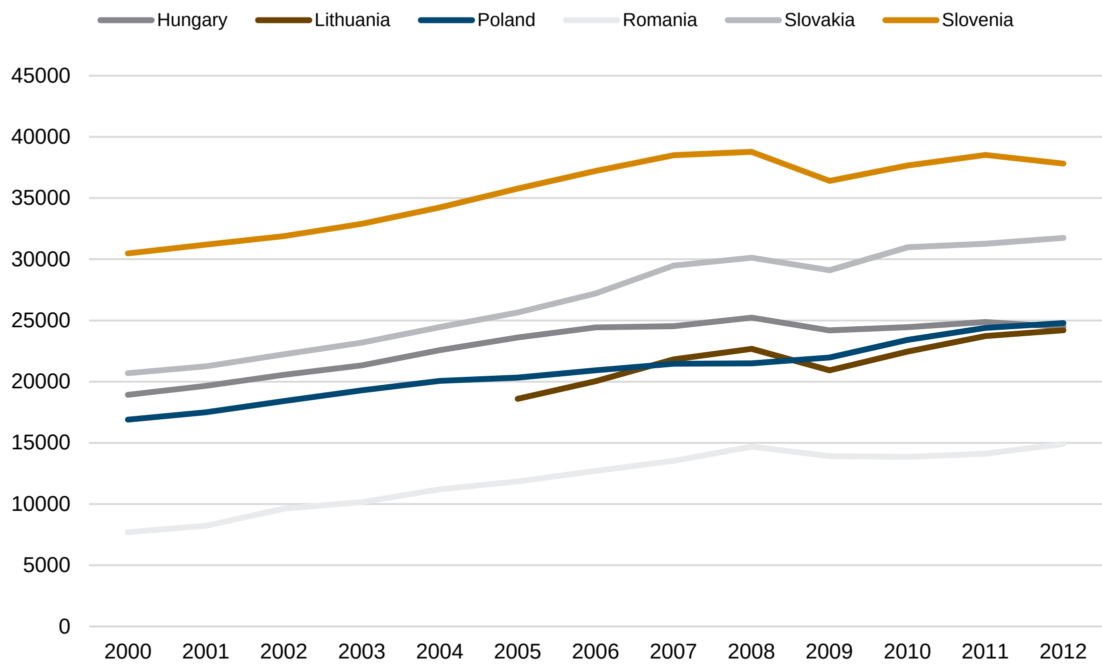
Source: wiiw Statistics, own calculations.

Figure A 9 / Real labour productivity per person: OMS (in 1.000 EURO per employee)



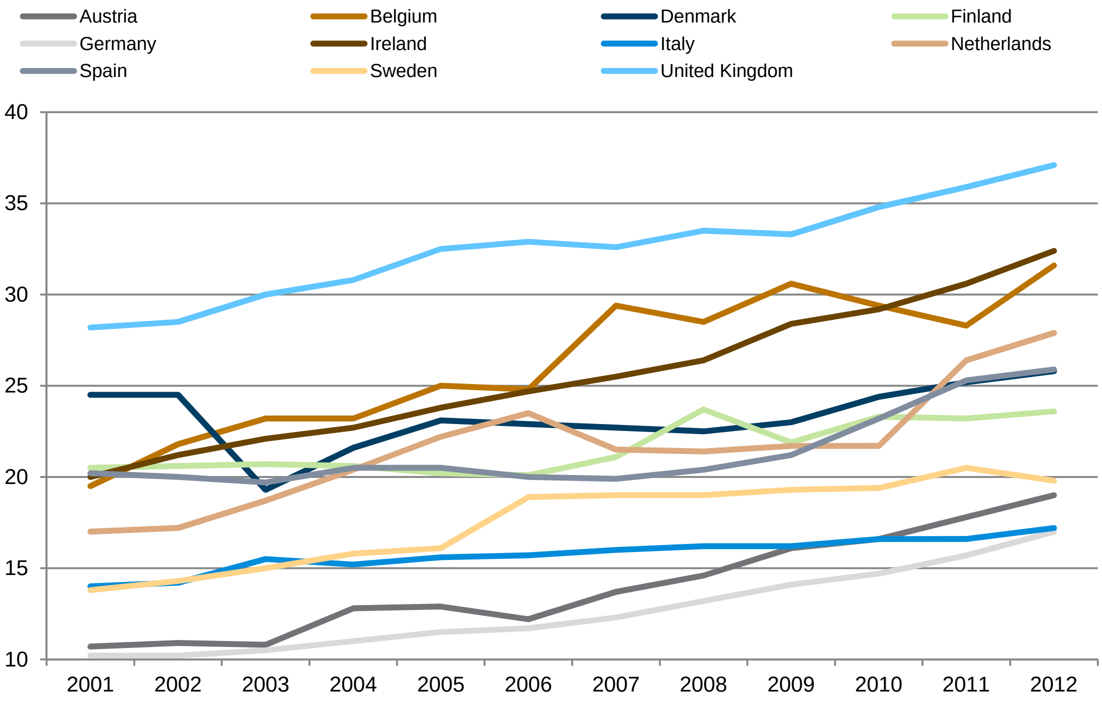
Source: Eurostat Statistics, own calculations.

Figure A 10 / Real labour productivity per person: NMS (in 1.000 EURO per employee)



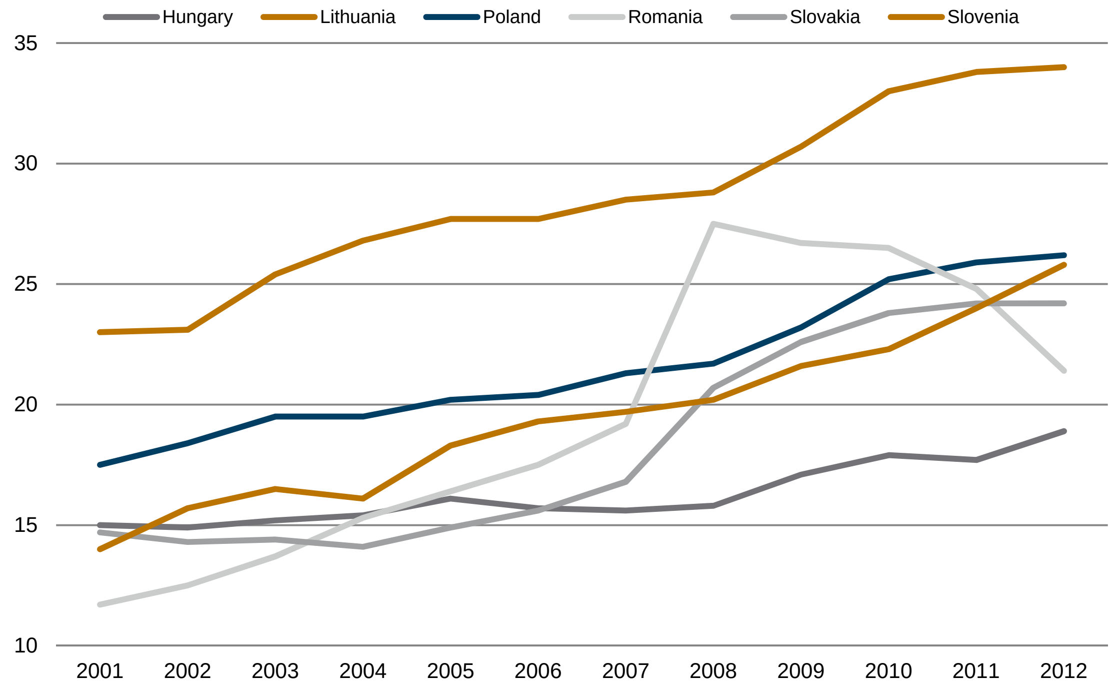
Source: Eurostat Statistics, own calculations.

Figure A 11 / Human capital index: OMS (in %)



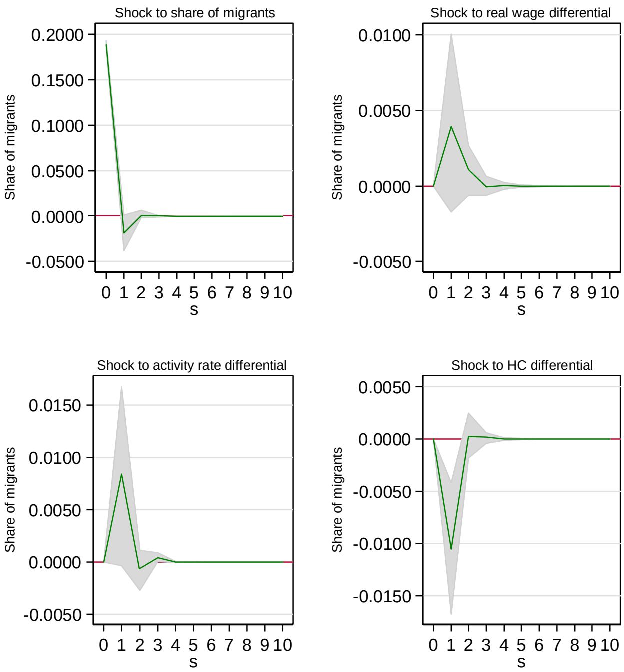
Source: Eurostat Statistics, own calculations.

Figure A 12 / Human capital index: NMS (in %)



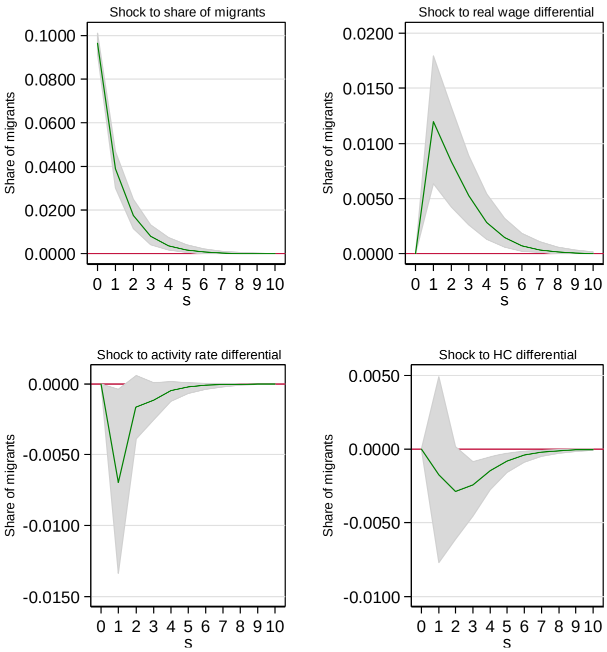
Source: Eurostat Statistics, own calculations.

Figure A 13 / Response of the share of migrants to shocks in other determinants: total sample (full specification)



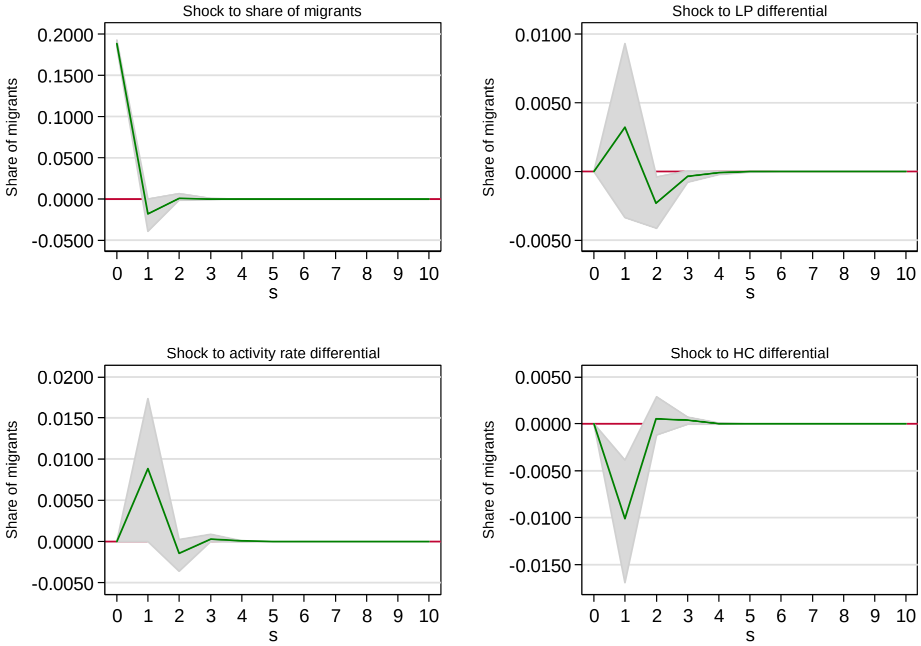
Source: own calculations.
Note: The green line refers to the impulse response, the grey area to the 95% confidence interval around the estimates; errors are generated by Monte Carlo simulation with 1000 repetitions.

Figure A 14 / Response of the share of migrants to shocks in other determinants: NMS-to-OMS sample only (full specification)



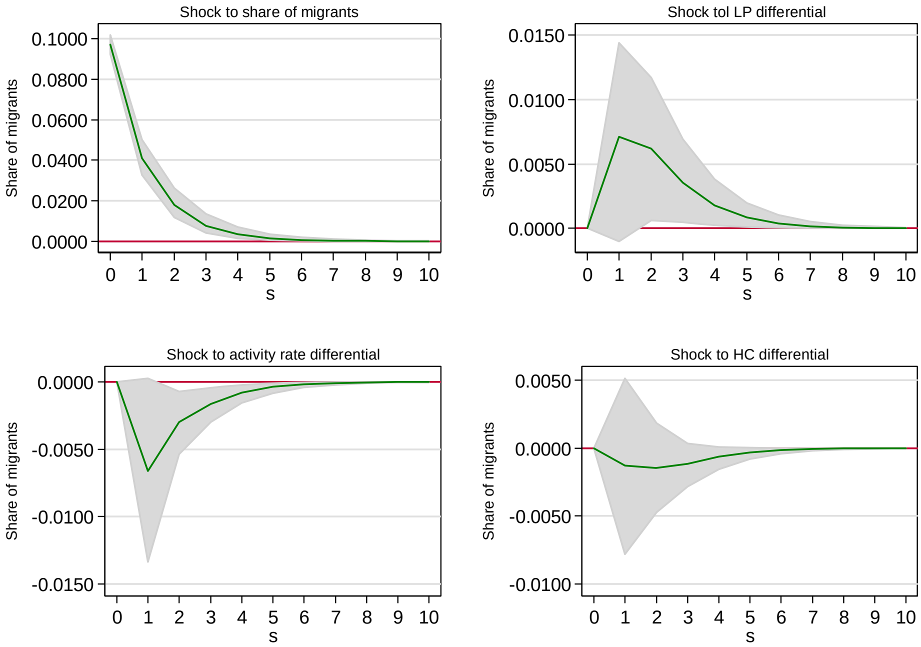
Source: own calculations.
Note: The green line refers to the impulse response, the grey area to the 95% confidence interval around the estimates; errors are generated by Monte Carlo simulation with 1000 repetitions.

Figure A 15 / Response of the share of migrants to shocks in other determinants: total sample (robustness analysis: excluding real wage differentials)



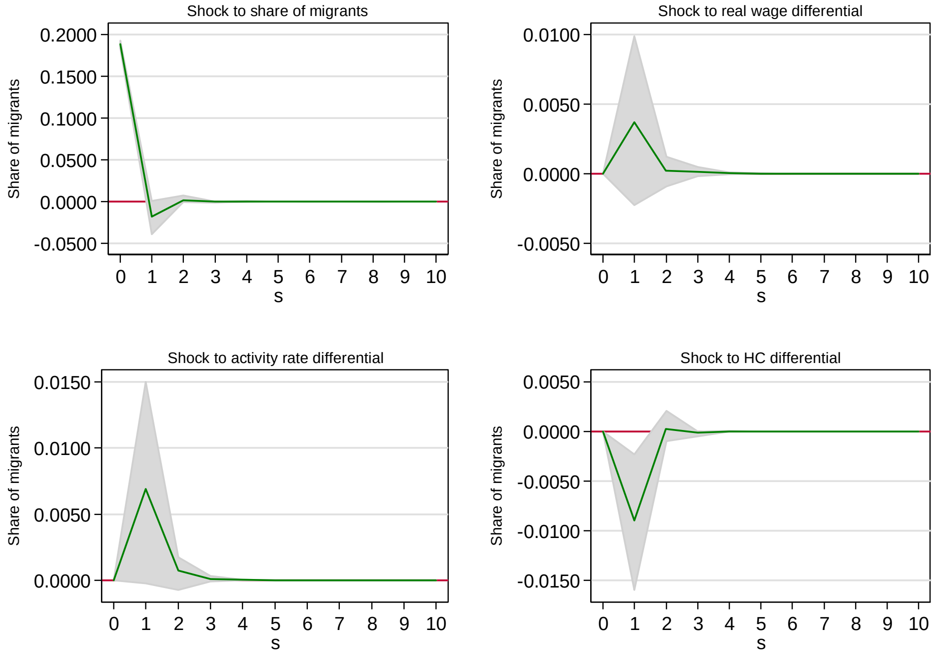
Source: own calculations.
Note: The green line refers to the impulse response, the grey area to the 95% confidence interval around the estimates; errors are generated by Monte Carlo simulation with 1000 repetitions.

Figure A 16 / Response of the share of migrants to shocks in other determinants: NMS-to-OMS sample only (robustness analysis: excluding real wage differentials)



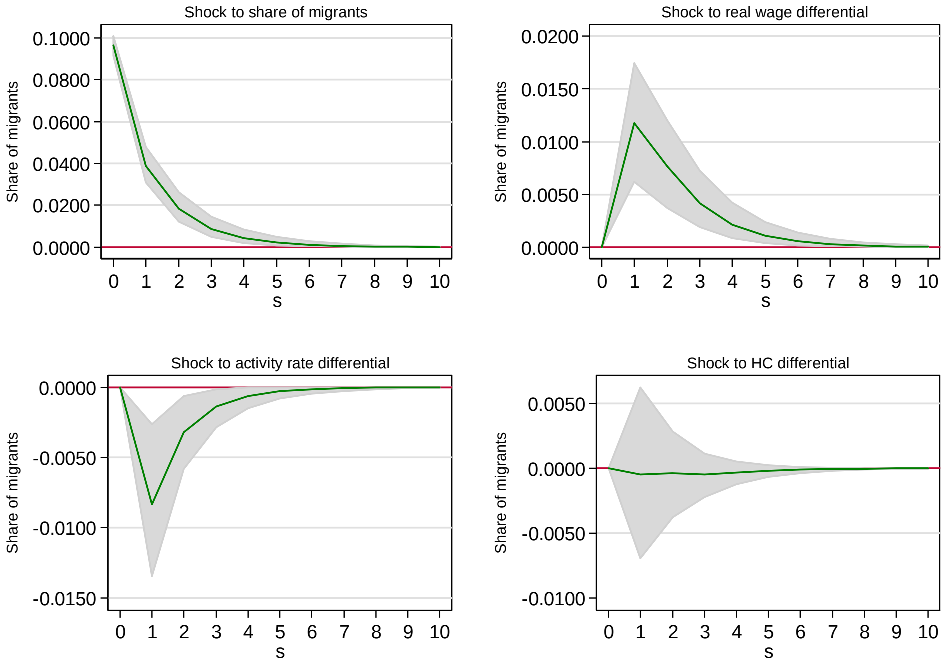
Source: own calculations.
Note: The green line refers to the impulse response, the grey area to the 95% confidence interval around the estimates; errors are generated by Monte Carlo simulation with 1000 repetitions.

Figure A 17 / Response of the share of migrants to shocks in other determinants: total sample (robustness analysis: excluding real labour productivity differentials)



Source: own calculations.
Note: The green line refers to the impulse response, the grey area to the 95% confidence interval around the estimates; errors are generated by Monte Carlo simulation with 1000 repetitions.

Figure A 18 / Response of the share of migrants to shocks in other determinants: NMS-to-OMS sample only (robustness analysis: excluding real labour productivity differentials)



Source: own calculations.
Note: The green line refers to the impulse response, the grey area to the 95% confidence interval around the estimates; errors are generated by Monte Carlo simulation with 1000 repetitions.

Table A 1 / Description of variables

Indicator	Definition	Data source
MNET (net migration)	Log of the difference between immigration and emigration	Eurostat
LP (labour productivity)	Difference in the log of real labour productivities; real labour productivity defined as: real GDP at market prices, chain-linked (2010=100) in million euro divided by total employment (in 1,000 persons) (employment – domestic concept)	Eurostat
ER (employment rate)	Difference in the log of the employment rates; the employment rate is defined as: 1-unemployment rate/100	Eurostat
ACT (activity rate)	Difference in the log of activity rates;	wiiw database
W (wages)	Real wages and salaries, CPI-deflated (in 2010 prices)	wiiw database
H (human capital index)	defined as weighted average of:	
	Upper secondary and post-secondary non-tertiary education (levels 3 and 4) as a share of age group from 15 to 19 years	Eurostat
	Graduates (ISCED 5-6) aged 20-29 per 1 000 of the corresponding age population	Eurostat
	Short-cycle tertiary education, bachelor or equivalent, master or equivalent and doctoral or equivalent level (levels 5-8) as share of total employment (resident population concept – LFS) aged from 15 to 64 years	Eurostat
MigStock (stock of migrants)	Log of the stock of migrants from country i residing in host country j, as share of the total migrant population in host country j	Eurostat

Table A 2 / Correlation matrix: total sample

	Net migration	Wage diff	LP diff	ER diff	ACT diff	HC diff
Net migration	1					
Wage diff	-0.044	1				
	(0.013)					
LP diff	-0.064	0.966	1			
	(0.000)	*(0.000)*				
ER diff	-0.092	0.480	0.374	1		
	(0.000)	*(0.000)*	*(0.000)*			
ACT diff	0.029	0.577	0.578	0.245	1	
	(0.095)	*(0.000)*	*(0.000)*	*(0.000)*		
HC diff	0.049	0.077	0.041	-0.032	0.109	1
	(0.006)	*(0.000)*	*(0.020)*	*(0.070)*	*(0.000)*	

Table A 3 / Correlation matrix: NMS-to-OMS sample

	Net migration	Wage diff	LP diff	ER diff	ACT diff	HC diff
Net migration	1					
Wage diff	-0.072	1				
	(0.043)					
LP diff	-0.123	0.811	1			
	(0.001)	*(0.000)*				
ER diff	-0.228	0.409	0.121	1		
	(0.000)	*(0.000)*	*(0.001)*			
ACT diff	0.005	0.185	0.243	-0.030	1	
	(0.893)	*(0.000)*	*(0.000)*	*(0.399)*		
HC diff	0.108	0.079	0.048	-0.036	0.142	1
	(0.002)	*(0.026)*	*(0.181)*	*(0.316)*	*(0.000)*	

Table A 4 / Summary statistics

Variables	Obs.	Mean	Std. Dev.	Min	Max
Total sample					
Net migration	3264	0.580	0.238	0.000	0.693
Real wage differential	3264	0.000	0.985	-2.733	2.733
Real LP differential	3264	0.000	0.882	-2.306	2.306
Employment rate differential	3264	0.000	0.065	-0.241	0.241
Activity rate differential	3264	0.000	0.119	-0.295	0.295
Human capital differential	3264	0.000	0.379	-1.075	1.075
NMS-to-OMS sample					
Net migration	792	0.610	0.215	0.000	0.693
Real wage differential	792	-1.272	0.473	-2.733	-0.119
Real LP differential	792	-1.169	0.373	-2.306	-0.302
Employment rate differential	792	-0.033	0.063	-0.192	0.215
Activity rate differential	792	-0.094	0.093	-0.295	0.157
Human capital differential	792	-0.009	0.353	-0.903	0.916

Table A 5 / Im-Pesaran-Shin unit root tests

	W-t-bar	p-value	lags*
Total sample			
Net migration	-1.70E+03	0.000	0.20
Real wage differential	-7.314	0.000	0.40
Real LP differential	-6.198	0.000	0.16
Employment rate differential	2.865	0.998	0.63
Activity rate differential	-9.472	0.000	0.25
Human capital differential	-7.753	0.000	0.19
Log of migrant share (population)	8.269	1.000	0.35
Log of migrant share (total stock of migrants)	-1.156	0.124	0.29
NMS-to-OMS sample			
Net migration	-2.90E+03	0.000	0.20
Real wage differential	-6.244	0.000	0.45
Real LP differential	-3.076	0.001	0.03
Employment rate differential	-0.797	0.213	0.62
Activity rate differential	-5.520	0.000	0.26
Human capital differential	-2.658	0.004	0.14
Log of migrant share (population)	1.671	0.953	0.31
Log of migrant share (total stock of migrants)	0.227	0.590	0.45

Note: * optimal lag length selected according to AIC, including a constant term; H0= all panels contain unit roots, Ha=some panels are stationary.

Table A 6 / Estimates of pVAR(1): total sample & NMS-to-OMS sample

	Total sample			NMS-to-OMS sample		
Dep.var: $\boldsymbol{Net\ migration_{ijt}}$						
	Coeff.	S.E.	t-stat	Coeff.	S.E.	t-stat
$Net\ migration_{ijt-1}$	0.375	0.053	7.029	0.360	0.092	3.909
$Real\ wage\ diff_{ijt-1}$	-0.003	0.029	-0.110	-0.074	0.039	-1.897
$Real\ LP\ diff_{ijt-1}$	-0.035	0.070	-0.507	-0.045	0.076	-0.586
$Activity\ rate\ diff_{ijt-1}$	0.364	0.363	1.002	0.612	0.464	1.319
$HC\ diff_{ijt-1}$	-0.128	0.057	-2.224	-0.023	0.080	-0.285
Dep.var: $\boldsymbol{Real\ wage\ differential_{ijt}}$						
	Coeff.	S.E.	t-stat	Coeff.	S.E.	t-stat
$Net\ migration_{ijt-1}$	0.012	0.024	0.524	0.102	0.050	2.040
$Real\ wage\ diff_{ijt-1}$	0.700	0.012	56.147	0.682	0.022	30.845
$Real\ LP\ diff_{ijt-1}$	-0.090	0.039	-2.298	-0.077	0.066	-1.154
$Activity\ rate\ diff_{ijt-1}$	-0.634	0.143	-4.434	-0.961	0.305	-3.153
$HC\ diff_{ijt-1}$	0.215	0.023	9.377	0.218	0.050	4.330
Dep.var: $\boldsymbol{Real\ labour\ productivity\ differential_{ijt}}$						
	Coeff.	S.E.	t-stat	Coeff.	S.E.	t-stat
$Net\ migration_{ijt-1}$	0.001	0.007	0.145	0.020	0.017	1.211
$Real\ wage\ diff_{ijt-1}$	0.043	0.003	13.378	0.047	0.006	7.457
$Real\ LP\ diff_{ijt-1}$	0.761	0.010	74.034	0.757	0.018	43.084
$Activity\ rate\ diff_{ijt-1}$	0.020	0.040	0.510	-0.032	0.081	-0.392
$HC\ diff_{ijt-1}$	-0.030	0.007	-4.459	-0.032	0.014	-2.255
Dep.var: $\boldsymbol{Activity\ rate\ differential_{ijt}}$						
	Coeff.	S.E.	t-stat	Coeff.	S.E.	t-stat
$Net\ migration_{ijt-1}$	0.001	0.004	0.219	0.004	0.008	0.484
$Real\ wage\ diff_{ijt-1}$	-0.017	0.002	-7.283	-0.019	0.004	-4.616
$Real\ LP\ diff_{ijt-1}$	0.036	0.006	6.245	0.038	0.009	4.058
$Activity\ rate\ diff_{ijt-1}$	0.723	0.025	28.403	0.702	0.050	14.074
$HC\ diff_{ijt-1}$	0.028	0.004	6.213	0.022	0.009	2.395
Dep.var: $\boldsymbol{HC\ differential_{ijt}}$						
	Coeff.	S.E.	t-stat	Coeff.	S.E.	t-stat
$Net\ migration_{ijt-1}$	-0.003	0.025	-0.136	0.026	0.043	0.610
$Real\ wage\ diff_{ijt-1}$	0.059	0.011	5.330	0.074	0.022	3.408
$Real\ LP\ diff_{ijt-1}$	-0.079	0.035	-2.274	-0.092	0.056	-1.626
$Activity\ rate\ diff_{ijt-1}$	-0.244	0.159	-1.539	-0.187	0.281	-0.663
$HC\ diff_{ijt-1}$	0.828	0.024	34.069	0.831	0.043	19.205
No of observations	2720			660		

Table A 7 / Variance decomposition: total sample

	after 5 periods					after 10 periods				
	Net mig	Wage diff	LP diff	AR diff	HC diff	Net mig	Wage diff	LP diff	AR diff	HC diff
Total sample										
Net mig	0.987	0.002	0.000	0.002	0.008	0.981	0.004	0.000	0.003	0.011
Wage diff	0.001	0.832	0.001	0.034	0.131	0.002	0.731	0.006	0.059	0.202
LP diff	0.002	0.174	0.804	0.000	0.020	0.002	0.213	0.760	0.003	0.021
AR diff	0.000	0.018	0.015	0.902	0.065	0.000	0.018	0.024	0.858	0.100
HC diff	0.010	0.125	0.005	0.005	0.855	0.010	0.144	0.006	0.014	0.827
Total sample: excluding real wage differentials										
Net mig	0.986		0.001	0.004	0.009	0.981		0.001	0.006	0.012
LP diff	0.004		0.961	0.015	0.019	0.005		0.914	0.022	0.059
AR diff	0.001		0.014	0.920	0.065	0.001		0.026	0.843	0.130
HC diff	0.008		0.045	0.021	0.926	0.008		0.041	0.044	0.907
Total sample: excluding real labour productivity differentials										
Net mig	0.981	0.004		0.005	0.010	0.969	0.005		0.013	0.013
Wage diff	0.001	0.645		0.207	0.148	0.001	0.501		0.350	0.148
AR diff	0.003	0.029		0.935	0.032	0.004	0.056		0.808	0.131
HC diff	0.004	0.097		0.090	0.809	0.004	0.084		0.172	0.741

Table A 8 / Variance decomposition: NMS-to-OMS sample

	after 5 periods					after 10 periods				
	Net mig	Wage diff	LP diff	AR diff	HC diff	Net mig	Wage diff	LP diff	AR diff	HC diff
NMS to OMS sample										
Net mig	0.966	0.017	0.000	0.016	0.001	0.954	0.023	0.001	0.021	0.002
Wage diff	0.032	0.824	0.002	0.048	0.093	0.029	0.742	0.008	0.067	0.153
LP diff	0.055	0.254	0.666	0.006	0.019	0.064	0.283	0.614	0.016	0.023
AR diff	0.001	0.054	0.014	0.903	0.029	0.001	0.052	0.023	0.885	0.039
HC diff	0.002	0.168	0.003	0.004	0.823	0.003	0.191	0.005	0.009	0.792
NMS to OMS sample: excluding real wage differentials										
Net mig	0.961		0.004	0.035	0.000	0.951		0.004	0.043	0.002
LP diff	0.022		0.898	0.041	0.039	0.021		0.817	0.055	0.107
AR diff	0.006		0.022	0.932	0.041	0.007		0.028	0.885	0.079
HC diff	0.001		0.053	0.028	0.919	0.001		0.048	0.053	0.899
NMS to OMS sample: excluding real labour productivity differentials										
Net mig	0.943	0.028		0.028	0.002	0.908	0.028		0.061	0.003
Wage diff	0.150	0.552		0.250	0.049	0.166	0.431		0.357	0.047
AR diff	0.077	0.043		0.837	0.043	0.068	0.073		0.716	0.142
HC diff	0.077	0.120		0.134	0.669	0.102	0.102		0.220	0.576

Table A 9 / Estimation results of pVAR(1) – excluding real wages: total sample & NMS-to-OMS sample

	Total sample				NMS-to-OMS sample		
Dep.var: $\boldsymbol{Net\ migration_{ijt}}$							
	Coeff.	S.E.	t-stat		Coeff.	S.E.	t-stat
$Net\ migration_{ijt-1}$	0.375	0.053	7.077	$Net\ migration_{ijt-1}$	0.366	0.093	3.950
$Real\ LP\ diff_{ijt-1}$	-0.037	0.067	-0.551	$Real\ LP\ diff_{ijt-1}$	-0.085	0.071	-1.198
$Activity\ rate\ diff_{ijt-1}$	0.374	0.345	1.084	$Activity\ rate\ diff_{ijt-1}$	0.887	0.434	2.044
$HC\ diff_{ijt-1}$	-0.129	0.058	-2.223	$HC\ diff_{ijt-1} -$	-0.032	0.081	-0.390
Dep.var: $\boldsymbol{Real\ labour\ productivity\ differential_{ijt}}$							
	Coeff.	S.E.	t-stat		Coeff.	S.E.	t-stat
$Net\ migration_{ijt-1}$	0.004	0.007	0.494	$Net\ migration_{ijt-1}$	0.016	0.018	0.919
$Real\ LP\ diff_{ijt-1}$	0.781	0.010	76.706	$Real\ LP\ diff_{ijt-1}$	0.782	0.017	46.688
$Activity\ rate\ diff_{ijt-1}$	-0.110	0.043	-2.593	$Activity\ rate\ diff_{ijt-1}$	-0.206	0.087	-2.359
$HC\ diff_{ijt-1}$	-0.016	0.007	-2.127	$HC\ diff_{ijt-1}$	-0.027	0.016	-1.700
Dep.var: $\boldsymbol{Activity\ rate\ differential_{ijt}}$							
	Coeff.	S.E.	t-stat		Coeff.	S.E.	t-stat
$Net\ migration_{ijt-1}$	0.000	0.004	-0.023	$Net\ migration_{ijt-1}$	0.006	0.009	0.633
$Real\ LP\ diff_{ijt-1}$	0.028	0.006	4.794	$Real\ LP\ diff_{ijt-1}$	0.027	0.010	2.879
$Activity\ rate\ diff_{ijt-1}$	0.774	0.026	29.407	$Activity\ rate\ diff_{ijt-1}$	0.772	0.052	14.726
$HC\ diff_{ijt-1}$	0.022	0.005	4.792	$HC\ diff_{ijt-1}$	0.019	0.010	1.972
Dep.var: $\boldsymbol{HC\ differential_{ijt}}$							
	Coeff.	S.E.	t-stat		Coeff.	S.E.	t-stat
$Net\ migration_{ijt-1}$	0.000	0.025	0.010	$Net\ migration_{ijt-1}$	0.020	0.043	0.455
$Real\ LP\ diff_{ijt-1}$	-0.051	0.033	-1.550	$Real\ LP\ diff_{ijt-1}$	-0.051	0.052	-0.990
$Activity\ rate\ diff_{ijt-1}$	-0.424	0.161	-2.628	$Activity\ rate\ diff_{ijt-1}$	-0.461	0.283	-1.632
$HC\ diff_{ijt-1}$	0.848	0.025	33.852	$HC\ diff_{ijt-1}$	0.840	0.044	19.076
No of observations	2720				660		

Table A 10 / Estimation results of pVAR(1) – excluding real LP: total sample & NMS-to-OMS sample

	Total sample				NMS-to-OMS sample		
Dep.var: $Net\ migration_{ijt}$							
	Coeff.	S.E.	t-stat		Coeff.	S.E.	t-stat
$Net\ migration_{ijt-1}$	0.379	0.052	7.279	$Net\ migration_{ijt-1}$	0.404	0.108	3.738
$Real\ wage\ diff_{ijt-1}$	-0.044	0.076	-0.572	$Real\ wage\ diff_{ijt-1}$	-0.119	0.074	-1.612
$Activity\ rate\ diff_{ijt-1}$	0.200	0.561	0.355	$Activity\ rate\ diff_{ijt-1}$	0.327	0.783	0.418
$HC\ diff_{ijt-1}$	-0.110	0.082	-1.347	$HC\ diff_{ijt-1}$	-0.018	0.084	-0.209
Dep.var: $Real\ wage\ differential_{ijt}$							
	Coeff.	S.E.	t-stat		Coeff.	S.E.	t-stat
$Net\ migration_{ijt-1}$	0.021	0.024	0.883	$Net\ migration_{ijt-1}$	0.179	0.076	2.349
$Real\ wage\ diff_{ijt-1}$	0.598	0.039	15.218	$Real\ wage\ diff_{ijt-1}$	0.604	0.058	10.383
$Activity\ rate\ diff_{ijt-1}$	-1.051	0.292	-3.601	$Activity\ rate\ diff_{ijt-1}$	-1.448	0.620	-2.335
$HC\ diff_{ijt-1}$	0.260	0.036	7.243	$HC\ diff_{ijt-1}$	0.227	0.056	4.088
Dep.var: $Activity\ rate\ differential_{ijt}$							
	Coeff.	S.E.	t-stat		Coeff.	S.E.	t-stat
$Net\ migration_{ijt-1}$	-0.003	0.005	-0.532	$Net\ migration_{ijt-1}$	-0.034	0.014	-2.459
$Real\ wage\ diff_{ijt-1}$	0.024	0.008	3.161	$Real\ wage\ diff_{ijt-1}$	0.020	0.011	1.801
$Activity\ rate\ diff_{ijt-1}$	0.889	0.050	17.758	$Activity\ rate\ diff_{ijt-1}$	0.942	0.101	9.295
$HC\ diff_{ijt-1}$	0.010	0.007	1.297	$HC\ diff_{ijt-1}$	0.017	0.013	1.374
Dep.var: $HC\ differential_{ijt}$							
	Coeff.	S.E.	t-stat		Coeff.	S.E.	t-stat
$Net\ migration_{ijt-1}$	0.005	0.026	0.176	$Net\ migration_{ijt-1}$	0.118	0.068	1.735
$Real\ wage\ diff_{ijt-1}$	-0.031	0.037	-0.827	$Real\ wage\ diff_{ijt-1}$	-0.020	0.052	-0.385
$Activity\ rate\ diff_{ijt-1}$	-0.611	0.295	-2.073	$Activity\ rate\ diff_{ijt-1}$	-0.769	0.563	-1.365
$HC\ diff_{ijt-1}$	0.867	0.037	23.388	$HC\ diff_{ijt-1}$	0.842	0.049	17.044
No of observations	2720				660		

WIIW WORKING PAPERS PUBLISHED SINCE 2012:

For current updates and summaries see also wiiw's website at www.wiiw.ac.at

No. 120 Michael Landesmann and Sandra M. Leitner (in collaboration with Isilda Mara): Intra-EU Mobility and Push and Pull Factors in EU Labour Markets: Estimating a Panel VAR Model, August 2015

No. 119 Michael Landesmann and Sandra M. Leitner: Labour Mobility of Migrants and Natives in the European Union: An Empirical Test of the 'Greasing of the Wheels' Effect of Migrants, August 2015

No. 118 Johannes Pöschl and Katarina Valkova: Welfare State Regimes and Social Determinants of Health in Europe, July 2015

No. 117 Mahdi Ghodsi: Distinguishing Between Genuine and Non-Genuine Reasons for Imposing Technical Barriers to Trade: A Proposal Based on Cost-Benefit Analysis. July 2015

No. 116 Mahdi Ghodsi: The Role of Specific Trade Concerns Raised on TBT in the Import of Products to the EU, USA and China. June 2015

No. 115 Mahdi Ghodsi: Determinants of Specific Trade Concerns Raised on Technical Barriers to Trade. June 2015

No. 114 Sandra M. Leitner and Robert Stehrer: What Determines SMEs' Funding Obstacles to Bank Loans and Trade Credits? A Comparative Analysis of EU-15 and NMS-13 Countries. May 2015

No. 113 Sebastian Leitner: Effects of Income Inequality on Population Health and Social Outcomes at the Regional Level in the EU – Differences and Similarities between CEE and Non-CEE EU Regions. May 2015

No. 112 Arne J. Nagengast and Robert Stehrer: The Great Collapse in Value Added Trade. April 2015

No. 111 Michael Landesmann, Sandra Leitner and Isilda Mara: Should I Stay, Should I Go Back or Should I Move Further? Contrasting Answers under Diverse Migration Regimes. January 2015

No. 110 Robert Stehrer: Does the Home Bias Explain Missing Trade in Factors? December 2014

No. 109 Sebastian Leitner and Robert Stehrer: Labour Market Transitions of Young People during the Economic Crisis. November 2014

No. 108 Neil Foster-McGregor, Johannes Pöschl and Robert Stehrer: Capacities and Absorptive Barriers for International R&D Spillovers through Intermediate Inputs. October 2014

No. 107 Arne J. Nagengast and Robert Stehrer: Collateral Imbalances in Intra-European Trade? Accounting for the Differences between Gross and Value Added Trade Balances. July 2014

No. 106 R. Stöllinger and M. Holzner: State Aid and Export Competitiveness in the EU. December 2013

No. 105 N. Foster-McGregor, A. Isaksson and F. Kaulich: Importing, Productivity and Absorptive Capacity in Sub-Saharan African Manufacturing Firms. November 2013

No. 104 I. Mara and M Landesmann: The Steadiness of Migration Plans and Expected Length of Stay – Based on a Recent Survey of Romanian Migrants in Italy. September 2013

No. 103 I. Mara and M Landesmann: Do I Stay because I am Happy or am I Happy because I Stay? Life Satisfaction in Migration, and the Decision to Stay Permanently, Return and Out-migrate. August 2013

No. 102 R. Falvey and N. Foster-McGregor: On the Trade and Price Effects of Preferential Trade Agreements. May 2013

No. 101 R. Stehrer: Accounting Relations in Bilateral Value Added Trade. May 2013

No. 100 K. Laski and H. Walther: Kalecki's Profit Equation after 80 Years. April 2013

No. 99 N. Foster, A. Isaksson and F. Kaulich: Foreign Ownership and Labour Markets in Sub-Saharan African Firms. March 2013

No. 98 N. Foster, A. Isaksson and F. Kaulich: Importing, Exporting and the Productivity of Services Firms in Sub-Saharan Africa. March 2013

No. 97 N. Foster, A. Isaksson and F. Kaulich: Outward Foreign Direct Investment, Exporting and Firm-Level Performance in Sub-Saharan Africa. March 2013

No. 96 N. Foster, A. Isaksson and F. Kaulich: Importing, Exporting and Performance in sub-Saharan African Manufacturing Firms. March 2013

No. 95 S. M. Leitner and R. Stehrer: R&D and Non-R&D Innovators in the Financial Crisis: the Role of Binding Credit Constraints. February 2013

No. 94 G. Streicher and R. Stehrer: Whither Panama? Constructing a Consistent and Balanced World SUT System including International Trade and Transport Margins. January 2013

No. 93 M. Holzner: The Determinants of Income Polarization on the Household and Country Level across the EU. September 2012

No. 92 M. Kelle: Crossing Industry Borders: German Manufacturers as Services Exporters. July 2012

No. 91 S. M. Leitner , R. Stehrer and B. Dachs: The Gravity of Cross-border R&D Expenditure. July 2012

No. 90 N. Foster, J. Pöschl and R. Stehrer: Offshoring and the Elasticity of Labour Demand. July 2012

No. 89 N. Foster, J. Pöschl and R. Stehrer: Manufacturing Productivity: Effects of Service Sector Innovations and Institutions. July 2012

No. 88 A. Breitwieser and N. Foster: Intellectual Property Rights, Innovation and Technology Transfer: A Survey. June 2012

IMPRESSUM

Herausgeber, Verleger, Eigentümer und Hersteller:
Verein „Wiener Institut für Internationale Wirtschaftsvergleiche“ (wiiw),
Wien 6, Rahlgasse 3

ZVR-Zahl: 329995655

Postanschrift: A 1060 Wien, Rahlgasse 3, Tel: [+431] 533 66 10, Telefax: [+431] 533 66 10 50
Internet Homepage: www.wiiw.ac.at

P.b.b. Verlagspostamt 1060 Wien

Offenlegung nach § 25 Mediengesetz: Medieninhaber (Verleger): Verein „Wiener Institut für Internationale Wirtschaftsvergleiche“, A 1060 Wien, Rahlgasse 3. Vereinszweck: Analyse der wirtschaftlichen Entwicklung der zentral- und osteuropäischen Länder sowie anderer Transformationswirtschaften sowohl mittels empirischer als auch theoretischer Studien und ihre Veröffentlichung; Erbringung von Beratungsleistungen für Regierungs- und Verwaltungsstellen, Firmen und Institutionen.

wiiw.ac.at