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Can Labour Mobility Reduce Imbalances in the Euro Area?

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Contents

Abstract

Labour market developments in the Euro area diverged significantly since 2008. Economic literature frequently refers to labour mobility as pillar for the functioning of currency areas. Applying the CGE model PuMA, we quantitatively analyse to what extent labour mobility can contribute to reducing imbalances within the Euro area. Our results indicate that it can temporarily reduce unemployment and increase wages in periphery countries at the cost of somewhat higher unemployment in receiving countries. Overall, economic outcomes improve slightly. Although labour mobility has a positive effect on labour market imbalances, it cannot be seen as substitute for structural reforms.
Keywords: International migration; wage level and structure; unemployment; general equilibrium models; Euro area; **JEL-Classification: F22, D58, J11, J31, J61, J64**[1]

1 Introduction and Motivation

The Euro area was introduced 20 years ago in January 1999 with the official launch of a single currency, physical notes and coins were introduced three years later. Economic differences between member states of the Euro area pose a burden to the political systems and to economic policy. They are a major challenge for monetary policy as well. In a monetary union, a single country in a crisis cannot devaluate its currency in order to regain external competitiveness. Thus, structural reforms are of major importance to increase competitiveness, boost growth and welfare, and decrease unemployment. However, such policies often take time to become effective, leading to a persistent increase of unemployment in these countries. According to Bentivogli and Pagano (1999), there are several different adjustment mechanisms available in a single currency area, such as labour mobility, flexible real wages, a redistributive fiscal system, as well as capital and income flows. As stated by Mundell (1961), factor mobility is an important condition for the functioning of a currency area, especially if other adjustment mechanisms are not sufficiently flexible.[2] Although capital is mobile within the Euro area, labour mobility is yet weakly developed and the success of an increased mobility depends on how well migrants are integrated in host labour markets.

The economic crisis had a pronounced impact on European labour markets. From 2008 to 2013, unemployment rates rose considerably, from 7% to 10.9% in the European Union and from 7.6% to 12% in the Euro area. Since then, labour market conditions improved significantly, the European Union unemployment rate is at pre-crisis levels. The overall development masks that changes in unemployment were very unequally distributed among member states. While unemployment is significantly higher than ten years ago in some countries, like Greece, Spain, and Italy, it increased only moderately or even decreased in other countries, like Germany, the Netherlands and Austria. In general, southern European countries ("periphery countries") were hit much harder by the crisis than countries in the middle and north of Europe ("core countries"). In 2018, the spread of unemployment rates in the European Union between the country with the lowest and the highest unemployment rates still amounted to 17% points. In comparison, the spread across different US states, at 4.2% points, is significantly lower. Boeri and Jimeno (2016) argue that, in interaction with the magnitude and nature of the shocks, this divergence is related to different labour market institutions. In line with that, van Ours (2015) conclude that labour markets in some countries are more vulnerable to economic shocks than others. The deterioration of labour market conditions affected social cohesion in European Union countries. It also burdens public finances through the direct and indirect costs of unemployment.

This paper quantitatively assesses the role of labour mobility in the Euro area on the economies and, especially, on labour markets. The application of dynamic computable general equilibrium (CGE) models is standard for this type of analysis. We apply the dynamic general equilibrium model PuMA to analyse the

[1]We gratefully acknowledge funding by the Anniversary Fund of the Oesterreichische Nationalbank, No. 16276.

[2]Mundell (1961), McKinnon (1963) and Kenen (1969) developed the framework of the theory of optimum currency areas (OCA). After the initial impulse in the 1960s, there was a slowdown in research on this topic. In the 1990s, research on the OCA theory re-emerged, largely influenced by the foundation of the European Monetary Union. Among them, for instance, De Grauwe (2003) argues that countries with different labour market institutions might feature different responses to economic shocks, which makes it costly to run a currency union.

impact on both the origin and destination countries.[3] We address the question of how much mobility can contribute to better labour market outcomes in the different regions and across the Euro area.

The remainder of the paper is organised as follows. Section 2 discusses literature about the impact of migration on the economy and labour markets. Section 3 provides stylised facts on labour mobility in the Euro area. The main features of the model used for the simulations are presented in Section 4. Section 5 describes the base and simulation scenarios, while Section 6 provides quantitative results for sending and receiving countries, Section 7 discusses sensitivity scenarios considering a different skill-structure of migrants and imperfect substitutability between natives and foreigners. Section 8 concludes.

2 Related Literature

Given the focus of our paper, we confine the literature review to the labour market impact of migration. Other relevant and related topics, such as the impact of migration on public finance, attitudes toward migration and political economy issues such as electoral behavior, are beyond the scope of the current paper.

Whether and to what extent labour mobility improves labour market outcomes and welfare depends on the labour market situation in both the sending and host countries as well as the characteristics of individuals who migrate. In particular, it is important whether migrants find a job in the host country and whether migration affects wages as well as (native) employment and unemployment. Among other personal characteristics, age, education and the labour market experience of migrants are crucially important.

In a standard model with only one type of labour, higher labour supply would decrease wages and/or increase unemployment in the short-run, as long as there is a capital adjustment rigidity, see for instance Levine (1999), Boeri and Brücker (2005) and Brücker and Jahn (2011). However, as e.g. Bruecker and Jahn (2011) or Barrell et al. (2006) demonstrate, the impact on wages and the unemployment rate vanishes as the capital stock adjusts to the supply shock in the medium- and long-run. This fundamental result is adjusted in the literature for several reasons. In this context, Ben-Gad (2008) demonstrates that high-skilled migration will raise low-skilled wages while dampening high-skilled wages. He finds that the welfare surplus of migration on natives is ten times larger if migration is skill-intensive. Docquier et al. (2014) find that migration reduced wage inequality in receiving countries as migrants to OECD countries were, on average, better educated than natives between 1990 and 2000.

To derive the impact of labour mobility, it is also necessary to take into account a possible mismatch between qualification and job requirements. In general, migrants are more often formally overqualified in their job compared to natives in the host country. Migrants are also heavily concentrated in specific economic sectors, like construction, manufacturing, hotel and restaurants, employment in private households, and agriculture (OECD (2012)). This leads to lower productivity and a wage gap compared to a situation in which they are employed according to their qualifications and experience.

Another branch of the literature analyses whether migrants and natives are complements or substitutes in production. Ethnic and cultural differences, along with language skills, are regularly mentioned as possible sources of migrants and natives being complements. If both are substitutes, migration will negatively affect natives due to lower wages and higher unemployment in the short-run, whereas it can even favor natives if they are complements. This issue is illustrated in a discussion between Borjas (2003) and Ottaviano and Peri (2006). Borjas implicitly assumes that natives and migrants with the same education and experience are perfect substitutes and finds that a ten percent increase of overall labour supply in the economy due to migration decreases wages by three to four percent. Applying the same method and assumption, Bonin (2005) estimates a value of one percent for Germany.

In contrast, Ottaviano and Peri find that migration actually increases the wages of natives, while wages of foreigners already employed in the host country decline. This is a result of different assumptions as they

[3] The following model simulations are performed in a model that has been calibrated to pre-2020 data. However, unless the Covid pandemic has significantly altered post-Covid labour markets in the Euro area, the results remain valid in post-Covid era.

allow for capital stock adjustment and include imperfect substitution between natives and migrants with similar education and experience. They justify the latter assumption by empirical estimates in the same paper. In response to these estimates, Borjas et al. (2008) state that the significance of imperfect substitutability hinges on the treatment of high-school students and dropouts. Removing this group from the dataset, they cannot reject the hypothesis that native and migrant workers are perfect substitutes, a result that is also stated in Borjas (2014). Similarly, Edo and Toubal (2015) find that immigrants and natives with a similar level of education and experience tend to be perfect substitutes. Using German data, Felbermayr et al. (2014) find finite, but rather high, elasticities of substitution. Estimates about the elasticity of substitution usually range between 6 and 20 (see Manacorda et al. (2012)). Foged and Peri (2016) use the dispersal policy of refugees in Denmark as a natural experiment to derive the impact of refugee migration on the wages and employment of natives. They find evidence for imperfect substitutability between refugees and natives.

Concerning the impact of migration on wages, many older studies, typically based on differences of the share of foreigners to determine the impact of migration, find small and often insignificant effects, see, for example, Longhi et al. (2006), Borjas et al. (1997), De New and Zimmermann (1994) or Winter-Ebmer and Zimmermann (1998). Semi-elasticities for wages are above -0.2 implying that an increase in the share of foreigners by one percentage point decreases wages by 0.2% at most.

Other studies take into account differences in the skill structure of foreigners in different regions, which also helps to overcome endogeneity problems (e.g. if migrants predominantly settle in regions with good economic opportunities). Borjas (2003) and Aydemir and Borjas (2007) find much higher wage (elasticity of -0.3 to -0.6) and employment effects. Using a similar method, but allowing for capital adjustment and complementary between foreigners and natives, Ottaviano et al. (2006) and Ottaviano and Peri (2008) again find a lower wage effect amounting to -0.1. However, while they find a small and possibly positive effect on natives' wages, wages of foreigners decline significantly in the short-run. D'Amuri et al. (2010), Felbermayr et al. (2014) and Brücker and Jahn (2011) find similar effects for Germany.

Compared to the vast empirical literature on wage effects of migration, empirical analysis on employment and unemployment effects is somewhat smaller. One can argue that there is some consensus that the employment rate effect is either insignificant or small, see e.g. Edo et al. (2018). It can be argued, that while aggregate effects are small, some groups may be more affected. For instance, D'Amuri and Peri (2014) find that as migrants often supply manual skills, some native workers switch their job toward more complex skills. Analyzing the inflow of refugees from Yugoslavia in the early 1990, Angrist and Kugler (2003) find that displacement effects of migration are more pronounced in countries with high rigidities.

While there is much literature regarding the impact of migration on host countries, there is less research about the effects on the sending countries.[4] Mishra (2007) finds that wages in a particular schooling-experience group in Mexico rise by 4% if the supply of workers due to migration in that group decreases by 10%, a result in line with Aydemir and Borjas (2007) and Borjas et al. (2008). Elsner (2013) reports results for emigration from Lithuania between 2002 and 2006. According to the estimation, a 10% point increase in the emigration rate will lead to an average increase in the real wages of men by 6.6%. The wage effect is statistically insignificant for women. Elsner (2015) states that emigration increases wages in the sending country only for people with substitutable skills similar to those of emigrants. Pryymachenko et al. (2013), estimating the impact of emigration in the EU8 countries from 2000 to 2007, find a decrease in the unemployment rate by at least 3.4% when the emigration rate increases by 10%. This result would imply a very high impact of emigration on unemployment in sending countries.

Brücker (2003) uses a general equilibrium model with imperfect labour markets and wage rigidities. For different specifications, migration corresponding to one percent of labour force for both sending and receiving countries (the two countries are equally large) results in a GDP increase (decrease) by around half a percent in the host (resp. sending) country. Due to higher productivity in the host country, overall GDP increases by approximately a quarter percent. The unemployment rate increases (decreases) by between 0.1 and 0.3% points

[4] See Pryymachenko et al. (2013).

in the host (resp. sending) country, overall unemployment slightly declines. These results indicate positive labour market effects of labour mobility.

We contribute to the existing literature by analysing the impact of labour mobility in the Euro area for both sending and receiving countries in a general equilibrium model with a profound representation of the labour market and educational attainment. We take into account in detail country-specific labour market institutions and characteristics of natives and migrants.

3 Labour Mobility in Europe - Stylised Facts

Labour mobility in Europe is significantly lower than in the United States, which is a currency area economically comparable to the Euro area. In 2017, 2.3% of the US population lived in a different state compared to the year before, while just 0.37% of the EU population migrated to a different country,[5] even though there was some increase of EU labour mobility in the last decade.[6] In general, persons moving are younger and better educated than the non-mobile population. For instance, Jauer et al. (2014) show that the share of persons aged between 20 and 34 years amounts to around 60% of all movers and that migrants from southern Europe tend to have lower unemployment rates in the sending country than the population who stayed in southern Europe. Fries-Tersch et al. (2018) find that movers living outside the country of origin have, on average, higher educational levels than those who did not move.

Holland and Paluchowski (2013) provide country specific information about migration flows within the EU and analyse the impact of the crisis. Intra-EU15 mobility rates dropped significantly in 2010, but increased in 2011 above the pre-crisis level. The patterns across the different countries changed significantly. According to the authors, net migration to the five periphery countries of Greece, Portugal, Italy, Spain, and Ireland dropped from about 1 million people per year before the crisis to less than 200,000 in 2011. On the other hand, net migration increased from more than 400,000 to 700,000 in 2011 in the five core countries considered in their analysis (DE, FR, UK, BE, and SE), dominated by flows to Germany. This is to a large extent caused by higher migration from the new member states, but also due to flows from the periphery countries. Gonzalez-Gago and Kirzner (2013) provide evidence that Germany ranks highest as a destination for Spanish nationals, a significant change compared to the past, which indicates that the German labour market situation is a pull factor for migrants. However, as Elsner and Zimmermann (2016) argue, this is far from being sufficient to significantly reduce pressure on the labour markets.

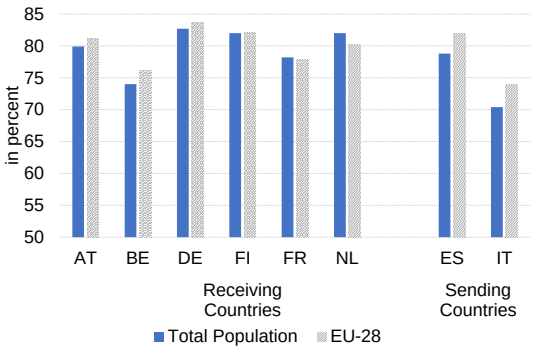
Apart from the number of migrants, labour market integration is a major determinant of the impact of labour mobility within the Euro area. As we analyse the impact of labour mobility for six "receiving countries" (Austria, Belgium, Finland, France, Germany and the Netherlands) and the two "sending countries" of Italy and Spain, the following stylised facts are shown for these eight countries. As illustrated in Figure 1, migrants within the EU28 are highly integrated in the labour market with very similar patterns of labour market participation and unemployment when compared to the total population. For all six host countries in our analysis, participation rates of migrants from EU28 countries are very similar to overall participation in these countries.[7] On the other hand, participation of EU28 migrants is above average in Spain and Italy. In contrast, the unemployment rate of migrants from EU28 countries is higher than for the overall population in all the countries except France. However, the pattern indicates that the labour market situation in the destination country has a greater influence on labour market integration than the situation in the source country.

[5] Data from Bureau of Labour Statistics and Eurostat Database. To some extent, this comparison is distorted by the fact that there are 28 EU Member States, but 50 US states. However, even when analyzing labour mobility across the EU's more than 200 NUTS 2 regions, Gakova and Dijkstra (2010) find that only 1.2% of the working age population changed their region of residence in 2008.

[6] In addition, Jauer et al. (2019) find evidence that migration in Europe has reacted more strongly to labour market shocks since the Great Recession. However, this adjustment was largely driven by citizens of countries outside the Euro area. Related to that research, Kahanec and Guzi (2017) find that (concerning their location decisions) migrants are more responsive to skill shortages than natives.

[7] The following simulations refines the analysis for differences according to age and educational attainment of migrants.

(a) Participation rate



(b) Unemployment rate

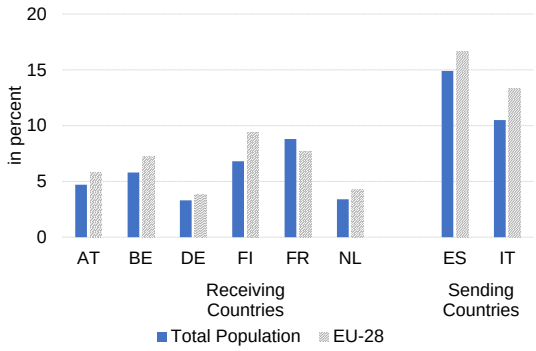


Figure 1: Participation and Unemployment Rates of Selected Countries in 2018 (20 to 64 years old)
Source: Eurostat.

Apart from labour market participation and unemployment, wages relative to natives determine the degree of labour market integration of migrants. To derive a wage gap, we calculate hourly wages based on EU-SILC data and perform Mincer regressions (with age in linear and quadratic form and the skill level (low, medium, high) taken into account), see Figure 2. Some countries, like Austria and the Netherlands, have rather high wage gaps between natives and EU28 migrants, while other countries have comparably low, if not negative, wage gaps. For the two sending countries of Spain and Italy, the gaps are similar to Austria. One possible reason for these pronounced differences is the different composition of migrants with respect to the country of origin.[8] Institutional differences between the countries, such as minimum wages, offer another reason.

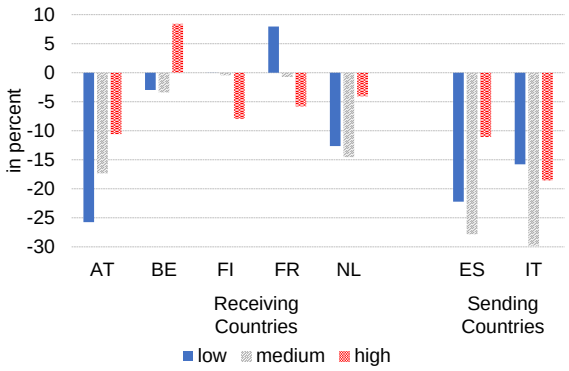


Figure 2: Wage Gap of EU28 Migrants Compared to the Native Population (15 to 69 years old, in percent)
Source: EU-SILC, own calculations. Persons in education not considered for calculations. Data for DE not available.

4 Model Description

To analyse the impact of labour mobility on the economies and, thereby, on imbalances in the Euro area, we apply the overlapping generations dynamic general equilibrium model PuMA[9], based on Jaag et al. (2010). As

[8] See, for instance, Dustmann and Van Soest (2002) and Yao and van Ours (2015), who analyse the impact of language proficiency on earnings and labour market performance.

[9] PuMA: Public policy Model for Austria and other European countries. The model is similar to the one used in Berger et al. (2016).

mentioned above, the model is applied to derive effects for 8 countries, 2 large sending (periphery) countries and the corresponding 6 most important receiving (core) countries in the Euro area. The application of general equilibrium models to analyse the effects of migration is rather common (see for example Borjas (2003), Brücker and Jahn (2011), or Bonin (2005)). It allows for deriving a broad range of effects, like labour market or wage impacts, to analyse different scenarios, and to take into account the age- and skill-structure of migrants, which can differ considerably from total population. Data also reveals that natives and foreigners have different labour market prospects and, in particular, that differences in the unemployment risk depend on age and skill level. For easier reading, we focus on the features of the model that are most relevant for this paper. A full model documentation can be found in Berger and Strohner (2020).

Demographics Representative households belong to one of eight life-cycle stages $a \in \{1, \ldots, 8\}$ imbedded in three life-cycle phases. They start with education, followed by a phase of labour market activity, and finish with retirement. Wages have a life-cycle profile consistent with empirical earnings. Households differ with respect to their country of origin, learning ability, and age.

For every a, households face a constant probability $1-\gamma^a$ of dying and a probability $\gamma^a\,(1-\omega^a)$ of surviving and moving to the next stage $a+1$, with $\omega^8 = 1$. The conditional probability $1-\omega^a$ defines how quickly households move from one stage to the other, on average so that households can stay in stage a several time periods.[10]. At the threshold stage $a^R = 5$, households endogenously choose their retirement age. Age groups $a \in \{6, 7, 8\}$ represent the full retirement phase.[11] Households have different learning abilities and choose education efforts to end up with one of three skill levels, $i \in \{l, m, h\}$, low, medium, or high.[12]

The model distinguishes domestic households ($n = D$) and EU-foreigners ($n = F$)[13] who differ, inter alia, in their labour market prospects. The model allows for exogenous inward and outward migration for each age- and skill-group for domestic and foreign households in each period of time, such that the age- and skill- structure of migrants is reflected.[14] When migration takes place, households carry financial assets across the border and preserve their pension rights.

Households and Labour Market In each period, households make consumption and labour market related decisions in order to maximise expected life-time utility. Preferences are represented with the utility theory developed by Weil (1990), allowing for an arbitrary intertemporal elasticity of substitution:[15]

$$V_t^{a,n} = \max\left[(Q_t^{a,n})^\rho + G\gamma^a\beta\left(\omega^a V_{t+1}^{a,n} + (1-\omega^a)V_{t+1}^{a+1,n}\right)^\rho\right]^{1/\rho}, \tag{1}$$

where $V_t^{a,n}$ is the expected remaining life-time utility of a household in life-cycle stage a and of origin n at time t, ρ defines the elasticity of intertemporal substitution $1/(1-\rho)$, β is a time discounting factor, $Q_t^{a,n}$ is effort-adjusted consumption (as defined below) and $G = 1+g$ is an exogenous trend growth factor by which the model is detrended.

Households make several labour market related decisions. Before entering the labour market, households choose their education level, depending on their learning ability, and the value function $V_t^{1,i,n}$ for the different skill groups. They enter the labour market in life-cycle stage $a = 1$ if they do not pursue education beyond the

[10] We use an implementation where the average durations of stay in each life-cycle stage correspond to ages 15-19, 20-24, 25-39, 40-54, 55-69, 70-79, 80-84, and 85+. We later use interchangeably the words "*life-cycle stage*" and "*age group*".

[11] The implementation of several old-age groups with different probabilities of dying $1-\gamma^a$ allows for a better replication of the age structure of the population.

[12] The division is based on the International Standard Classification of Education as designed by UNESCO. ISCED 0-2 is assigned to low-skilled, ISCED 3-4 to medium-skilled and ISCED 5+ to high-skilled.

[13] In this paper, foreign-born indicates a person born in a different European Union country. Persons born in third countries are included in the group of natives.

[14] We deliberately opt for exogenous migration instead of endogenously modelling location choices of households so that we are capable of analyzing pronounced labour mobility scenarios as described in section 5.2.

[15] For simplicity, we apply the skill i and nationality n only if needed, and only use the age class index a systematically in the continuation.

compulsory school period (respectively $a = 2$ for a medium skill education and $a = 3$ for tertiary education). In any period, there is a sequence of labour market activities as illustrated in Figure 3. i) workers decide whether to participate or not ($\delta^{a,n} \in [0, 1]$ represents the fraction of time they participate). Following Jaag et al. (2010), we consider that non-participation in the threshold group a^R is equivalent to retirement. ii) individuals who are not immediately allocated to a job (a share $1 - \varepsilon^{a,n}$) search for a new job, depending on future labour market prospects ($s^{a,n} \geq 0$ denotes the endogenously determined search intensity). iii) Together with the number of vacancies that firms offer, a linearly homogenous matching function determines the number of new job matches $(1 - \varepsilon^{a,n}) s^{a,n} f^{a,n}$. Therefore, unemployment results from matching frictions, using the static framework as in Boone and Bovenberg (2002). iv) Nash wage bargaining. v) layoff decision (firms keep a share $p^{a,n}$ of hired workers.) vi) Employed households decide how many hours of work they supply ($l^{a,n} \geq 0$). Thus, the (inverse of the) unemployment rate is given by

$$1 - u^{a,n} = p^{a,n} \left(\varepsilon^{a,n} + (1 - \varepsilon^{a,n}) s^{a,n} f^{a,n} \right). \tag{2}$$

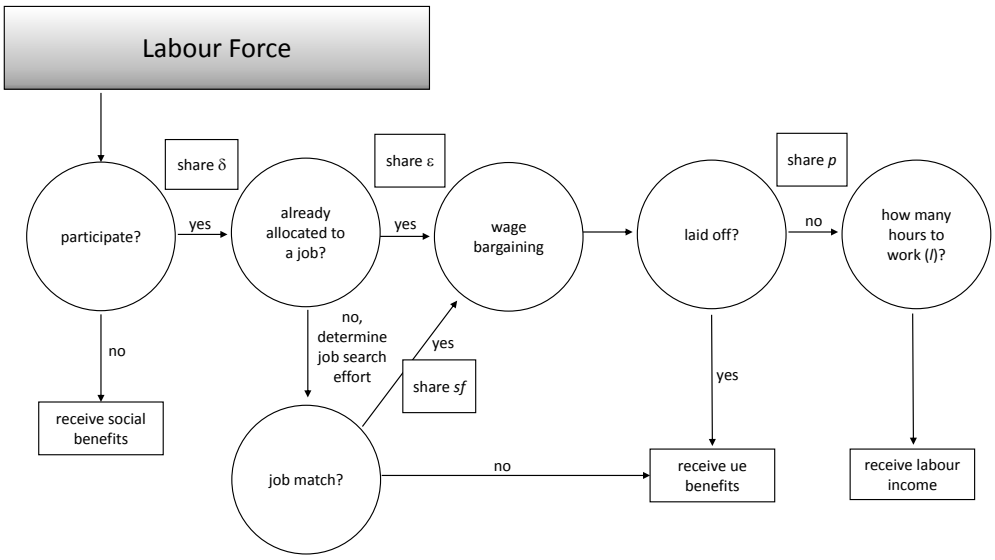


Figure 3: PuMA - Labour Market Structure

Labour and consumption trade-offs are defined by preferences and the effort-adjusted consumption

$$Q_t^{a,n} \quad = \quad C_t^{a,n} - \bar{\varphi}^{a,n} \left(\delta_t^{a,n}, l_t^{a,n}, s_t^{a,n} \right), \tag{3}$$

where $\bar{\varphi}^{a,n}(\cdot)$ is a convex increasing function in its arguments that represents the utility cost of efforts related to labour market activity expressed in goods equivalent terms. Given a reverse-life insurance based on Blanchard (1985), the intertemporal budget constraint of households is

$$G\gamma^a A_{t+1}^{a,n} = R_{t+1} \left(A_t^{a,n} + y_t^{a,n} - C_t^{a,n} \right), \tag{4}$$

where $A^{a,n}$ are assets, $y^{a,n}$ net income flows, and $R = 1 + r$ is the interest factor.

Households have different labour market experience, like differences in previous unemployment. Labour income profiles, consumption and saving decisions also differ. Thus, within the same life-cycle stage a, goods consumption $C_t^{a,n}$, effort-adjusted consumption $Q_t^{a,n}$ and assets $A_t^{a,n}$ always depend on the household biography.[16]

[16] The formulation of the value function allows for aggregation of the different households, even in case of the different biographies.

We assume separate labour supply, labour demand and job matching for each life-cycle stage a, skill class i, and nationality n. For instance, firms target labour demand according to life-cycle stage, skill class and nationality. Wage rates $w^{a,i,n}$ (per productivity unit $\theta^{a,i,n}$) are determined in a wage bargaining process, differ in each stage, skill and nationality class but are identical for workers within the same class. These productivity differentials θ are calibrated from wage data and, inter alia, reflect wage gaps for foreign born individuals. In the full model, households can engage in training measures implying endogenously determined productivity in the spirit of Heckman et al. (1998). Therefore, labour productivity is an endogenous result of the optimal education and training decisions of private households. This is similar to De La Croix and Docquier (2007) where human capital results from education and experience.

Conditional on labour market participation, gross labour income equals

$$y^{a,n}_{par,t} = (1 - u^{a,n}_t)\, l^{a,n}_t \cdot \theta^{a,n} \cdot w^{a,n}_t + u^{a,n}_t b^{a,n}_t. \tag{5}$$

Unemployment benefits $b^{a,n}_t$ are determined by institutional details and, in general, depend on previous income. When workers decide not to participate in the labour market, they collect net-of-tax welfare benefits $y^{a,n}_{nonpar,t}$, which are independent of wages and past earnings. In addition, he/she engages in home production. Retirees collect pension payments $y^{a,n}_{pens,t}$, which mainly depend on past earnings. Denoting $\tau^{a,n}_t$ the labour income tax and social security contribution rate and assuming that each labour market state (i.e. non-participation and employment) is visited in each time period,[17] income flows are

$$y^a_t = \begin{cases} \delta^{a,n}_t \cdot (1 - \tau^{a,n}_t) \cdot y^{a,n}_{par,t} + (1 - \delta^{a,n}_t) \cdot y^{a,n}_{nonpar,t} & \text{if } a < a^R, \\ \delta^{a,n}_t \cdot (1 - \tau^{a,n}_t) \cdot y^{a,n}_{par,t} + (1 - \delta^{a,n}_t) \cdot (1 - \tau^{a,n}_t) \cdot y^{a,n}_{pens,t} & \text{if } a = a^R, \\ (1 - \tau^{a,n}_t) \cdot y^{a,n}_{pens,t} & \text{if } a > a^R. \end{cases} \tag{6}$$

Production Following Keuschnigg and Kohler (2002) and Ratto et al. (2009), firms are divided into *capital firms* and *final goods firms*. Capital firms buy final goods in the home country and from the rest of the world, transform them into capital goods and act in a perfectly competitive environment. They provide capital goods to final goods firms and decide about the optimal level of physical investment to maximise their flow of dividends. The price of capital is influenced by the price of the investment good, the depreciation rate, the required rate of return of capital (determined on international capital markets), and the corporate income tax. Following Hayashi (1982), capital adjustment is associated with convex adjustment costs implying a smooth adjustment of the capital stock. Final goods firms produce for private and public consumption, investment and export. They operate in a monopolistic competition environment with free entry of firms and bear fixed costs in each period in the market, while producing a variety of goods and services. Capital and three types of labour corresponding to the three skill levels of workers[18] are used to produce a variety of goods and services. The production function, a linearly homogeneous nested CES function following Jaag (2009), is specified to ensure balanced growth at an exogenous rate g in equilibrium steady-states. Demand is determined by Dixit and Stiglitz (1977) preferences such that different brands are imperfect substitutes.

There is imperfect substitution between the three skill groups. We assume capital-skill complementarity, i.e. the elasticity of substitution between capital and low-skilled labour is lower than that between capital and skilled labour, an empirically realistic feature that can account for wage inequality variations (Krusell et al. (2000)).

Government and Institutional Settings Government expenditures include public consumption, defined exogenously in per capita terms. Long-term care and health care expenditures are defined exogenously in per

[17] An equivalent assumption is income pooling (perfect insurance) within each age, skill, and nationality class, as used in Andolfatto (1996), among others.

[18] We assume perfect substitutability for workers of different age but same skill level. In the main scenario, we also assume perfect substitutability between natives and migrants. However, unlike Borjas (2003), Ottaviano and Peri (2012) find imperfect substitutability. Thus, we relax the assumption of perfect substitutability in a sensitivity analysis in section 7.

capita and age terms. The state provides welfare, unemployment and pension benefits. To finance expenditures, the government collects taxes and social security contributions.[19] The government can borrow on the capital market. The modelling of the unemployment insurance and pension systems implies an individually perceived tax benefit link. Country-specific institutional settings are captured in the model in much detail. For instance, different arrangements for unemployment benefits (such as eligibility for benefits) can imply varying effects of migration in different countries.[20]

Calibration and Equilibrium For consistency between countries, the calibration is based on harmonised OECD and European Union data. Parameters for institutions are taken from the MISSOC database and the OECD Tax-Benefit model. Average personal income tax and social security contribution rates as well as wage gaps for foreign workers (compared to natives) are computed with EU-SILC microdata. The labour market prospects for the different age-, skill-, and nationality groups are based on LFS data for the different countries. Macroeconomic aggregates are derived from the System of National Accounts. We rely on empirical studies to define labour supply elasticity parameters following the literature discussion in Immervoll et al. (2007).

Given imperfect competition on the final goods market, clearing requires producers of the different varieties to set prices in such a way that the demand for investment, private consumption, public consumption, and export equals the supply of final goods. Holdings of foreign assets by domestic households evolve with changes in the trade balance. The asset market clears in a standard fashion, net financial assets $A_t^{a,n}$ of households being split between holdings of public debt, foreign assets and assets invested in domestic firms.

5 Description of the labour mobility scenarios

5.1 Baseline Scenario

The aim of the current paper is to quantitatively assess the possible labour market and economic impact of higher labour mobility in the Euro area and to investigate to what extent it can contribute to reducing labour market imbalances between the countries. In a first step, we replicate future projected labour supply developments by taking into account changes in the native and foreign-born populations in a baseline scenario. In the short-run, migration is the most important source of changes in the working age population. We follow migration assumptions from the Europop population projections. To the extent that these migrants of the baseline scenario integrate in labour markets and compete with migrants of the labour mobility scenario described below, it is important to include the baseline projection in the analysis.

In addition to population and labour supply, we replicate the forecasted economic development in the baseline scenario. Short term growth and unemployment prospects are provided by the economic forecast of the European Commission. For the following years, we assume a linear adjustment of growth and unemployment rates within three years such that the output gap is closed and unemployment equals the NAWRU. Output gap and NAWRU are taken from the AMECO (annual macro-economic) database of the European Commission.

5.2 Labour Mobility Scenario

The current paper studies the impact of higher labour mobility within the Euro area. In particular, we assume migration from the two large southern Euro area member states, Italy and Spain, toward the six northern Euro area member states Austria, Belgium, Finland, France, Germany, and the Netherlands. This country selection includes the two largest member states (DE and FR) as well as several economically and institutionally different smaller member states.

[19] In Strohner et al. (2019), the authors apply the PuMA model to investigate the economic, labour market, and public finance impact of a tax reform in Germany.

[20] Transfers to private households as well as income tax rates and social security contribution rates are age-, skill-, and origin-dependent.

In our labour mobility scenario, we hypothetically assume an increase of net migration from the two sending countries of 1% of their working age population (aged 15 to 64 years) within a period of 4 years. This results in a total of 700,000 people migrating; thereof 310,000 from Spain and 390,000 from Italy, as seen in Table 1. These people are distributed across the 6 receiving countries according to the distribution of outward migration of these two countries in the past two years. Thus, Germany (300,000 people or 41%) and France (240,000; 37%) receive the major share of migrants, while Finland (1%) is least affected. However, relative to the size of the host country population, Belgium is most affected as the number of additional migrants amounts to 0.94% of the population, see Table 1. From 2013-2017, a total of around 670,000 people migrated from Spain and Italy to the six northern countries of our analysis (550,000 people migrated from Spain and Italy to the total Euro area).[21] Thus, our labour mobility scenario (1% of working age population or 700,000 people) corresponds to more than a doubling of migration numbers.

PuMA features a detailed demographic breakdown according to age and educational attainment, which is also implemented in the migration analysis. The age structure of migrants is taken from Eurostat data on recent Italian and Spanish outward migration experience. This data confirms that migrants are usually significantly younger than the total population: more than 70 percent of people migrating from Italy and Spain are younger than 40 years. Finally, we assume that the educational attainment of the additional migrants is distributed according to the population in the respective age groups in the two sending countries (an assumption that we relax in a sensitivity scenario below). Even though past experience (see section 3) indicates that movers have higher average educational levels than those who do not move, the pronounced labour mobility scenario that we analyse requires a broader selection of people. Note that both countries are characterised by a higher share of low-skilled individuals than in northern European countries. About 40% of the additional migrants can be characterised as low-skilled. This implies that, in relative terms, the gain in the population is highest for the group of low-skilled in all receiving countries.

The resulting number of additional migrants according to educational attainment for sending and receiving countries is presented in Table 1. The six receiving countries are larger than the two sending countries so that the 700,000 people account for 0.58% of receiving countries' working age population. Thus, when interpreting the simulation results, one should keep in mind that the 1% of working age population in Italy and Spain correspond to 0.58% of receiving countries' working age population and 0.37% of the overall working age population in the eight countries considered.

	in 1.000 people				in % of working age population			
Sending Countries	Low	Medium	High	Total	Low	Medium	High	Total
ES	127.0	67.5	113.6	308.1	1.0%	1.0%	1.0%	1.0%
IT	150.5	170.9	70.5	391.9	1.0%	1.0%	1.0%	1.0%
Total	277.5	238.4	184.1	700.0	1.0%	1.0%	1.0%	1.0%
Receiving Countries	Low	Medium	High	Total	Low	Medium	High	Total
AT	11.7	11.5	6.7	29.9	1.41%	0.37%	0.37%	0.52%
BE	27.1	22.6	18.5	68.2	1.56%	0.81%	0.67%	0.94%
DE	120.3	107.8	76.6	304.8	1.73%	0.35%	0.52%	0.58%
FI	2.6	2.1	1.8	6.5	0.63%	0.13%	0.13%	0.19%
FR	96.9	79.7	66.8	243.4	1.14%	0.45%	0.45%	0.59%
NL	18.9	14.8	13.6	47.2	0.79%	0.33%	0.33%	0.43%
Total	277.5	238.4	184.1	700.0	1.33%	0.39%	0.46%	0.58%

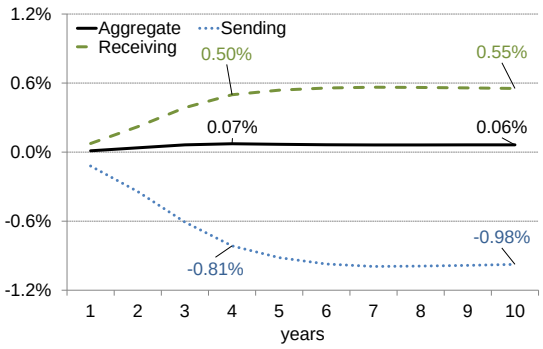
Right panel of the Table shows share of migrants in percent of working age population (15-64). Classification of educational levels according to ISCED 2011: low (ISCED 0-2), medium (ISCED 3-4), high (ISCED 5+).

Table 1: Number of additional migrants

Source: own calculations based on Eurostat.

[21] 490,000 of them migrated to the 6 receiving countries.

(a) Employment



(b) Employment - Receiving Countries

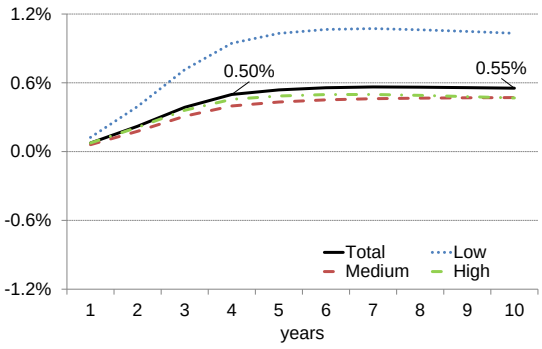


Figure 4: Employment Effects of Increased Labour Mobility
Source: Model Simulations PuMA.

6 Impact of Higher Labour Mobility

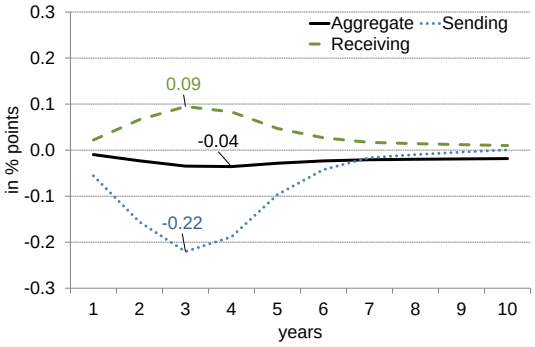
The labour supply shock induced by higher labour mobility exerts a significant influence on employment. The employment effects of increased labour mobility in our main labour mobility scenario are illustrated in Figure 4. In the receiving countries, a gradual adjustment of employment to the labour supply shock can be observed. This gradual adjustment is for two main reasons. First, adjustment of the capital stock and the economy to the labour supply shock takes some time, *inter alia* due to capital adjustment costs. Second, and more importantly, we do not assume a one-off labour mobility increase but, instead, an increase over a period of four years, as described in Section 5.2. On average, across the six receiving countries, employment is 0.5% higher than in the base scenario in the fourth year of our analysis. Due to the ongoing adjustment of the economy, the impact increases slightly through year 10 of our reform scenario. This is slightly less pronounced than the aforementioned increase of 0.58% of the working age population, which is due to slightly below-average labour market integration of foreign-born people in receiving countries.

Vice versa, reduced labour supply implies that employment declines (compared to the base scenario) by 0.8% in year 4 and nearly 1% in year 10 on average in the two sending countries, Italy and Spain. Summing up the employment effect in sending and receiving countries, our analysis reveals a moderate increase of total employment by slightly less than 0.1% as a result of better employment opportunities in the northern euro member states. Even though this number may appear comparatively small, it should be considered that only 0.37% of the total working age population migrate in our policy scenario.

As seen in the detailed Table 2 in the Appendix, the employment decline in the sending countries is fairly evenly distributed across the three different educational levels, which is based on the even share of labour mobility across the skill groups. As migrants are younger than average and as people aged 25 to 39 years are better educated and have higher employment rates than the total working age population, the employment effect is slightly more pronounced for high-skilled individuals. In contrast to this, the employment impact is clearly unevenly distributed across skill-groups in the receiving countries. Given that average educational attainment in the two sending countries is significantly lower than in the receiving countries, low-skilled migrants are over-represented relative to the native population in the receiving countries (see Table 1). Thus, as illustrated in the right panel of Figure 4, the relative employment impact is more pronounced for low-skilled individuals. Low-skilled employment increases by more than 1% in the receiving countries, while medium- and high-skilled employment increases by less than 0.5%.

In the short run, the positive labour supply shock cannot be absorbed fully, in particular due to matching frictions on the labour market, but also due to a delayed adjustment of the capital stock. Thus, we observe an increase in the unemployment rate of about 0.1% points in the receiving countries through year 3. However,

(a) Unemployment



(b) Unemployment - Receiving Countries

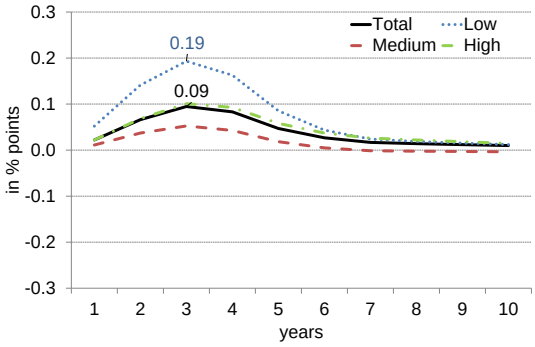
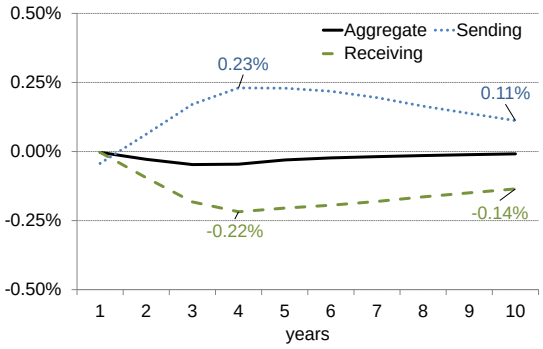


Figure 5: Unemployment Effects of Increased Labour Mobility
Source: Model Simulations PuMA.

(a) Net Wages



(b) Net Wages - Receiving Countries

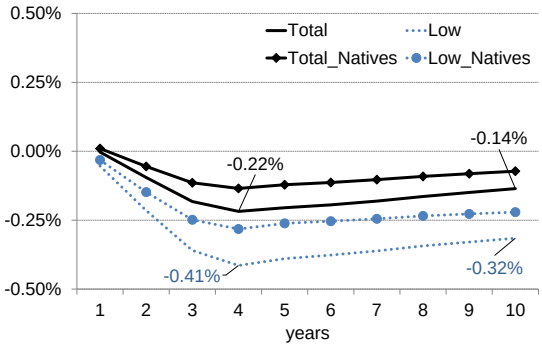


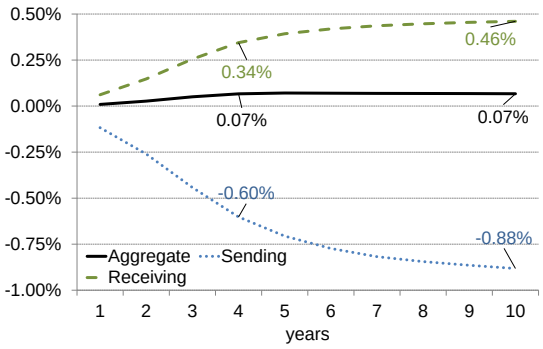
Figure 6: Wage Effects of Increased Labour Mobility
Source: Model Simulations PuMA.

this hike disappears when the economy adjusts to the supply shock. Vice versa, outward migration eases the tense unemployment situation in the two sending countries to some extent; our simulations indicate a maximum 0.2% point decline in the unemployment rate. Thus, our results show that labour mobility can reduce labour market imbalances to some extent. While the unemployment rate in the sending countries is forecast to be 6.1% points higher than in the receiving countries, our labour mobility scenario reduces this gap by 0.3% points, which corresponds to 5% of the gap. Summing up sending and receiving countries, labour mobility (amounting to 0.37% of the total working age population) can reduce *total* unemployment by around 0.05% points (in year 4) due to the more favorable labour market situation in receiving countries.

Similar to employment effects, the unemployment impact is fairly evenly distributed across the three educational groups in the sending countries, see Table 2 in the Appendix. In contrast to this, and as previously argued, the average educational attainment of migrants is comparably lower than that of the native population in the receiving countries. As illustrated in the right panel of Figure 5, the rise in the unemployment rate of low-skilled individuals is twice as high (0.2% points) as the overall increase of the unemployment rate.

Labour mobility reduces individual wages in receiving countries for three main reasons. First, the temporary decline of the capital to labour ratio reduces labour productivity and, thus, wage bargaining reduces wages ('displacement effects'). Second, migrants are younger and less skilled than the native population in this scenario, implying below average wages. Third, even for the same age and educational attainment, foreign-born

(a) GDP, real



(b) Overall Macroeconomic Effects

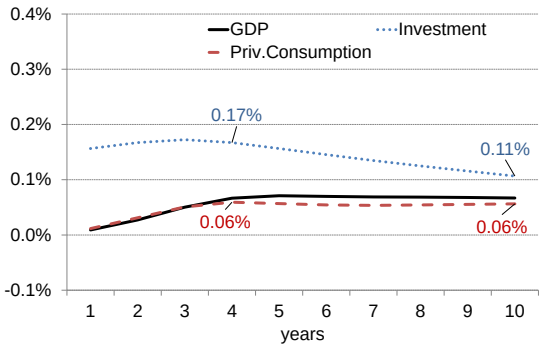


Figure 7: Macroeconomic Effects of Increased Labour Mobility
Source: Model Simulations PuMA.

individuals usually experience a wage gap in receiving countries, as illustrated in figure 2. The latter two aspects of the wage impact can be seen as a 'compositional effect'. In our scenario, net wages in receiving countries are reduced by 0.2% in year 4 and still more than 0.1% after ten years, as illustrated in the left panel of Figure 6. Vice versa, wages increase by roughly the same amount in sending countries. However, wages moderately decline on average. This somewhat surprising result can be attributed to wage gaps of foreign-born workers in receiving countries. Similar to employment and unemployment effects, the wage impact for low-skilled individuals in receiving countries is more pronounced, as illustrated in the right panel of figure 6. Low-skilled wages decline approximately twice as much as the average. In that sense, increased labour mobility exerts distributional effects.

In order to filter the importance of the different factors for the wage impact, we illustrate wage effects for native individuals in receiving countries in the right panel of Figure 6 as these workers are only affected by the displacement effect. Approximately half of the negative wage impact in receiving countries can be attributed to the displacement effect (while the other part is due to compositional effects). Across the three educational groups, wages decline by 0.13% (compared to 0.22%) in year 4 and 0.07% (compared to 0.14%) after ten years when we look at native wages only. Again, the impact is more pronounced for low-skilled native individuals.

In contrast to this, aggregate displacement effects are moderate when we look at the employment impact for natives in receiving countries in Table 2. Across the three educational groups, they are moderate (-0.04%) in the short-run and zero after ten years. Still, our simulations indicate displacement effects for low-skilled natives as employment declines by 0.2%, provided the over-proportionate share of low-skilled migrants in our scenario.[22]

Our labour market results fit pretty well in the range of existing papers. The boost in labour mobility increases the share of migrants in the workforce by 0.58%, corresponding to 0.4% of the overall population of receiving countries. Given that wages decline by 0.15% to 0.2% in the receiving countries, the corresponding semi-elasticity is 0.4 to 0.5, which is pretty much in the range of estimates, see e.g. Aydemir and Borjas (2007). The semi-elasticity of the unemployment rate with respect to changes of the workforce in the receiving countries corresponds to about 0.15. This moderate impact is in line with the results of Brücker et al. (2009). The impact on wages and unemployment in the *sending countries* is qualitatively the same as in the literature but somewhat lower.[23]

[22] In contrast to this, employment for medium-skilled natives even increases as the different educational groups are complementary in production and as medium-skilled inflow is disproportionately small.

[23] There may be several reasons why (model) results differ from each other. One reason could be that the duration of labour contracts in Spain and Italy is lower than e.g. in Germany or the Netherlands. If labour contracts would be more permanent, outward migration of unemployed persons might, *ceteris paribus*, reduce the unemployment rate more pronouncedly in the short-run.

The impact on macroeconomic aggregates is illustrated in Figure 7. For the receiving countries, the positive labour supply shock increases GDP. However, the gradual adjustment of the capital stock (due to installation costs) reduces average labour productivity. In addition, labour productivity of migrants is below average. Thus, the impact on GDP in receiving countries is less pronounced than the employment impact. In year 4, GDP rises by around 0.35%, compared to an employment increase of 0.5%. Vice versa, the same arguments are true for sending countries. GDP declines by 0.6% in year 4, while the employment effect is -0.8%. Compared to the relative working age population shock (1% for sending, 0.58% for receiving countries), we find that labour mobility moderately reduces (resp. increases) GDP per working age person in receiving countries (in sending countries). In total, labour mobility moderately increases GDP (and, thus, GDP per capita) by about 0.1% due to positive aggregate employment effects. While the effect appears moderate, we should keep in mind that our main scenario, albeit implying pronounced increases of migration flows, assumes migration of 0.37% of the overall working age population only. The right panel of Figure 7 illustrates the overall impact on other macroeconomic aggregates. Basically, private consumption changes in line with GDP. Investment increases more substantially at impact as firms attempt to adjust the capital stock in response to the labour supply shock.

Thus, our analysis reveals that labour mobility could temporarily reduce labour market pressure and improve overall macroeconomic performance to some extent. However, labour mobility (at plausible volume) alone cannot close the gap between the labour markets of periphery and core countries.

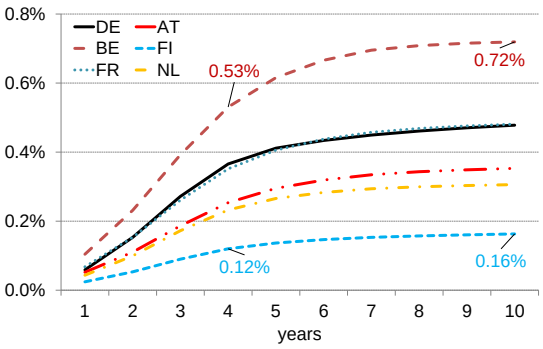
Cross-Country Analysis for Receiving Countries The economic impact of our labour mobility scenario is very different in the six receiving countries, as illustrated by GDP effects in Figure 8. While the positive labour supply shock increases GDP by 0.7% within ten years in Belgium, the increase is less than 0.2% in Finland. Clearly, much of this gap can be attributed to differently large labour supply shocks relative to host-country working age populations, as shown in Table 1. While the additional migrants account for nearly 1% of working age population in Belgium, they amount to 0.2% in Finland. We account for the different size of the shock in the right panel of Figure 8 by normalising the impact to the average size of the shock (0.58%) in each receiving country. Obviously, normalising for the size of the shock reduces variety in the effects to a great extent. However, some differences still remain. While GDP rises by 0.5% after ten years in Finland after accounting for the size of the shock, the impact is less pronounced in Austria and the Netherlands (0.4%). Comparing these numbers with the labour supply shock that they are normalised to (0.58% of working age population), shows that the policy scenario reduces GDP per working age population in each of the six receiving countries. As illustrated in Figure 2, Austria and the Netherlands, the two countries with the smallest impact in the normalised scenario are the two countries where the wage gap between the native population and EU migrants (for same age and education) is the largest. This indicates that labour productivity of EU migrants is below productivity of the native population, such that additional migration from these countries has a slightly smaller economic impact.

As shown in Table 1, the labour supply shock is particularly concentrated on low-skilled workers in Germany. This results from the fact that the share of low-skilled individuals in Germany's native population is considerably lower than in other receiving countries. In contrast, the population is much more evenly distributed across the three educational groups in the Netherlands. This implies that the effects of labour mobility on unemployment (we illustrate the "normalised scenario" in Figure 9) are fairly evenly spread among the different educational groups in the Netherlands, whereas low-skilled unemployment (maximum change of 0.25% points) increases significantly more pronounced than overall unemployment (0.07 p.p.) in Germany.

7 Sensitivity Analysis

We perform two sensitivity scenarios to investigate to what extent our results depend on characteristics frequently discussed in the literature. First, we consider a different educational distribution of migrants from periphery countries. In the second case, we assume imperfect substitutability between native and foreign workers.

(a) GDP, 6 Receiving Countries



(b) GDP Normalised, 6 Receiving Countries

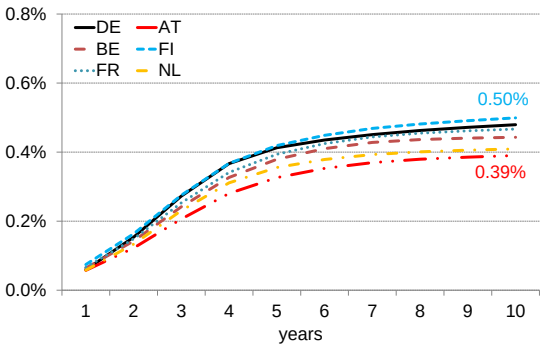
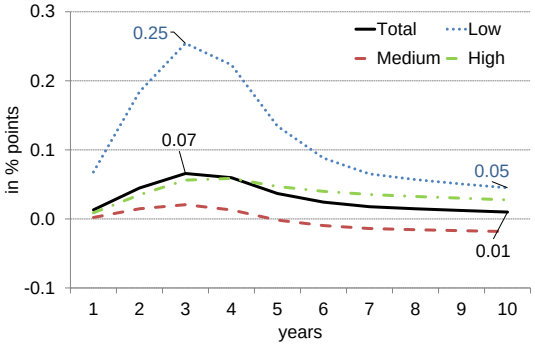


Figure 8: Cross-Country Differences: GDP Effects in 6 Receiving Countries
Source: Model Simulations PuMA.

(a) Unemployment Normalised - Germany



(b) Unemployment Normalised - Netherlands

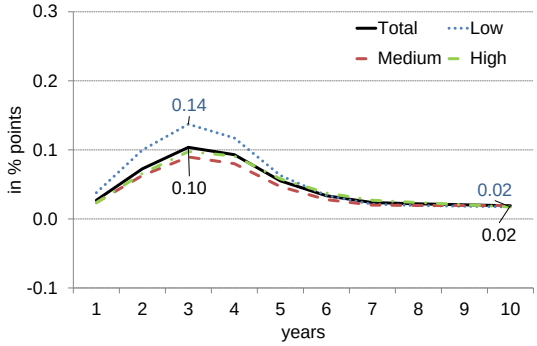


Figure 9: Unemployment Effects of Increased Labour Mobility, Germany vs. Netherlands
Source: Model Simulations PuMA.

Skill Distribution of Migrants In the main labour mobility scenario, we assume that the skill distribution of migrants from Italy and Spain corresponds to the skill distribution in the population (within each age group). Even though average educational attainment is comparatively low in Spain and Italy, a considerable share of medium- and high-skilled persons migrate toward the core countries. In a sensitivity analysis, we keep the age structure from the main scenario, but the skill structure is assumed to correspond to the unemployment distribution. This possibly reflects that unemployed people migrate to search for a job. Given that low-skilled individuals have higher unemployment rates, this assumption implies that migration is concentrated more heavily on low-skilled persons. The distribution of migrants across skill groups in the sensitivity analysis and in the main scenario is shown in Table 3 in the Appendix. While the share of each skill group amounts to 1 percent in the main scenario, 1.3% of low-skilled persons from Italy and 1.4% from Spain migrate toward the core countries in the sensitivity scenario. In contrast, the share of high-skilled migrants in the origin population amounts to only 0.6%. Accordingly, migration is more concentrated on low-skilled persons in the receiving countries in this scenario. In total, across all core countries, the number of low-skilled persons rises by 1.7% instead of 1.3% in the main scenario, while the increase of high-skilled individuals is 0.3% instead of 0.5%.

Our analysis reveals that although there is some economic impact of the different educational structure for sending and receiving countries, the overall area-wide impact is very moderate. After ten years, GDP rises by 0.40% instead of 0.46% (-0.06% points) in receiving countries and decreases by -0.79% instead of -0.88% (+0.09% points) in sending countries (differences in the outcome of the two scenarios are found in Table 4 in

the Appendix). Even though the overall effect of the skill shift is rather negligible, there are distributional effects in the sending and receiving countries (see Figure 10 in the Appendix). For instance, the higher share of low-skilled reduces low-skilled labour productivity and wages in the receiving countries. In contrast, high-skilled labour productivity rises compared to the main scenario, which implies a corresponding wage increase. Vice versa, in the two sending countries, as more low-skilled individuals leave, the sensitivity scenario results in higher wages for those low-skilled individuals who stay in the country. Overall, a shift of migration toward low-skilled individuals would lead to a compressed wage distribution in the periphery countries and to higher income inequality in the core countries. Analogous distributional effects occur for unemployment rates. Thus, even though this scenario is more beneficial for sending countries, it might be more difficult to handle for receiving countries. However, as illustrated in the lower panel of Figure 10, the different educational structure barely affects country-wide unemployment rates.

Imperfect Substitutability of Foreign and Native Workers In a second sensitivity analysis, we investigate the impact of imperfect substitutability of foreign and native workers. The literature provides a broad range of possible elasticities, see chapter 2. We assume a substitution elasticity of 10 in the simulation, a value centered in the range of existing empirical estimates. Even though the empirical literature often focuses on complementarity between low-skilled migrants from less developed countries and natives, we apply the same elasticity of substitution of 10 to all skill groups.

Due to more favourable effects of migration on labour productivity of natives, the labour market impact for natives in the receiving countries is more positive than in the scenario with perfect substitutability between migrants and natives. For the native population, the slightly negative wage impact is reduced from -0.08% in the main scenario to -0.04% in the sensitivity scenario (+0.04%). Nevertheless, an elasticity of substitution of 10 is not sufficient for native wages to rise in response to migration. This implies a less positive effect than in Foged and Peri (2016), who find a positive impact on native wages. Interestingly, the aggregate wage effect (native plus migrant population) is the same in the main and in the sensitivity scenario. This means that the more beneficial impact of imperfect substitutability for the native population is set-off by less beneficial effects for the foreign-born, a result in line with Ottaviano and Peri (2012). The results for the aggregate of countries as well as receiving and sending countries is shown in Table 6. Similar to the skill sensitivity scenario, the unemployment gap between sending and receiving countries is unaffected by the extent of substitutability between natives and the foreign-born. In that sense, the extent to which labour mobility can reduce imbalances is not affected by the educational structure of individuals and the elasticity of substitution between native and migrant workers.

8 Conclusions

In a currency area, individual countries cannot devaluate their currency in response to economic shocks to regain international competitiveness. Therefore, structural reforms are required to improve competitiveness, growth, and the labour market situation. However, such policies take time to be implemented and become effective. One possible way to overcome structural problems on the labour market in the short-run might be higher labour mobility.

Since the financial and economic crisis, labour market developments in the Euro area diverged significantly. Whereas unemployment increased moderately or even decreased in some countries, like Austria, Germany, or the Netherlands, it increased pronouncedly in other countries, like Greece, Italy, and Spain.

We analyse the possible impact of higher labour mobility within the Euro area countries by assuming additional migration from periphery countries, represented by Italy and Spain, toward core countries, represented by Austria, Belgium, Finland, France, Germany, and the Netherlands. We apply PuMA, a general equilibrium model with a detailed representation of demographics, labour markets and institutional settings, and provide

results for both sending and receiving countries as well as the overall sample of countries. We assume an additional migration of one percent of the working age population of the two sending countries, which corresponds to more than a doubling of migration numbers. On average, these migrants are younger than the sending countries' working age population, but we assume that they have the same skill structure. Given that the level of education in the two sending countries is lower, on average, than in the receiving countries, this implies a shift toward lower skills in these countries.

The simulation results indicate that labour mobility would temporarily reduce the unemployment rate in the sending countries by about 0.2% points. In addition, real wages could rise. In contrast, migration slightly deteriorates labour market outcomes in the receiving countries, especially for low-skilled individuals as unemployment rises and net wages decline. This labour market impact fades away to a considerable extent over time as the capital stock and labour market adjust to the labour supply shock. Considering the area-wide impact, employment rises by about 0.1% in the short run and unemployment declines slightly. As a result of the wage gap between natives and migrants in the receiving countries, wages do not rise in the area-wide aggregate of these countries.

We perform two sensitivity scenarios concerning the skill structure of migrants and imperfect substitutability of native and migrant workers, respectively. We find that these characteristics have some economic impact for sending and receiving countries, with a very moderate area-wide impact. Furthermore, these characteristics exert a distributional impact. However, the unemployment gap between sending and receiving countries is barely affected. In that sense, the extent to which labour mobility can reduce imbalances is not affected by the skill structure and the elasticity of substitution.

There are several topics left for future research. For instance, we do not discuss economic and labour market impacts in the context of people's attitudes toward migration and political economy issues such as voting behavior. In addition, while Berger et al. (2016) investigate the long-run impact of migration on public finances, we leave the short- and medium-run public finance impact of labour mobility and the consequences on the equivalence of contributions paid in receiving countries and public social security services possibly consumed in sending countries for future research.

Overall, our results imply that labour mobility could temporarily reduce labour market pressure, thereby reducing imbalances in the Euro area to some extent. However, labour mobility alone cannot close the gap between the labour markets in periphery and core countries. We find a reduction of the gap between sending and receiving countries' unemployment rates of only 5% (from 6.1 to 5.8 % points). A more significant reduction would require much higher migration than we assumed, which could imply strong effects and possibly social and political challenges in the receiving countries. We conclude that despite the fact that labour mobility has a positive (but limited) effect on unemployment, it cannot be seen as a substitute for structural reforms in the periphery countries.

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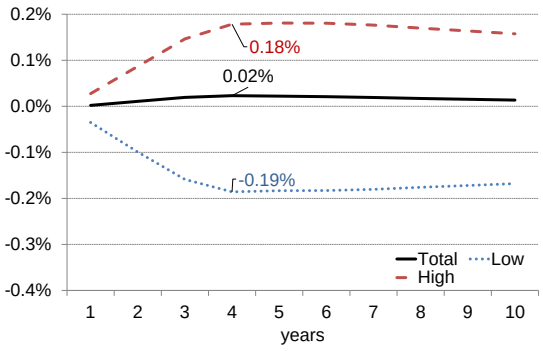
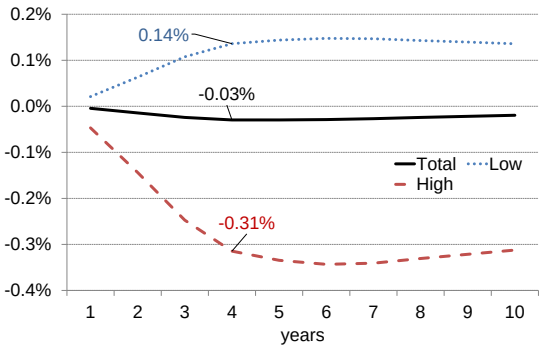
9 Appendix

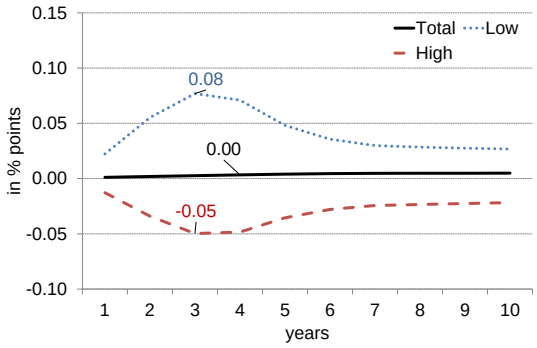
(a) Real net wage - Receiving Countries



(b) Real net wage - Sending Countries



(c) Unemployment - Receiving Countries



(d) Unemployment - Sending Countries

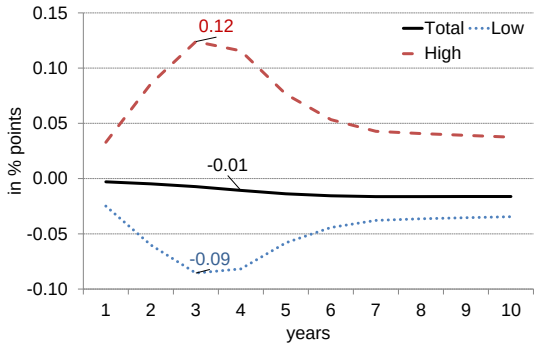


Figure 10: Sensitivity Analysis: Skill Distribution and Main Scenario - Differences in Real Net Wages and Unemployment
Source: Model Simulations PuMA.

Total	yr1	yr2	yr3	yr4	yr5	yr7	yr9	yr10
Real GDP	0.01%	0.03%	0.05%	0.07%	0.07%	0.07%	0.07%	0.07%
Investment, real	0.16%	0.17%	0.17%	0.17%	0.16%	0.13%	0.12%	0.11%
Private consumption, real	0.01%	0.03%	0.05%	0.06%	0.06%	0.05%	0.06%	0.06%
Employment (no. of workers)	0.01%	0.04%	0.06%	0.07%	0.07%	0.06%	0.06%	0.06%
-low	0.00%	0.04%	0.07%	0.08%	0.08%	0.07%	0.07%	0.08%
-medium	0.01%	0.05%	0.08%	0.09%	0.09%	0.09%	0.10%	0.10%
-high	0.01%	0.03%	0.04%	0.04%	0.03%	0.01%	0.00%	0.00%
Unemployment rate (change in pp)	-0.01	-0.02	-0.03	-0.04	-0.03	-0.02	-0.02	-0.02
-low	-0.01	-0.02	-0.03	-0.04	-0.03	-0.02	-0.02	-0.02
-medium	-0.01	-0.03	-0.04	-0.04	-0.03	-0.02	-0.02	-0.02
-high	-0.01	-0.02	-0.03	-0.03	-0.02	-0.02	-0.02	-0.02
Real net wages	0.00%	-0.03%	-0.05%	-0.05%	-0.03%	-0.02%	-0.01%	-0.01%
-low	-0.04%	-0.08%	-0.10%	-0.11%	-0.09%	-0.09%	-0.10%	-0.11%
-medium	0.00%	-0.01%	-0.02%	-0.01%	0.00%	0.01%	0.01%	0.01%
-high	0.00%	-0.03%	-0.06%	-0.06%	-0.05%	-0.02%	0.01%	0.02%
Receiving Countries	yr1	yr2	yr3	yr4	yr5	yr7	yr9	yr10
Real GDP	0.06%	0.15%	0.26%	0.34%	0.39%	0.44%	0.45%	0.46%
Investment, real	0.57%	0.60%	0.61%	0.62%	0.62%	0.60%	0.57%	0.55%
Private consumption, real	0.10%	0.21%	0.34%	0.42%	0.44%	0.47%	0.48%	0.49%
Employment (no. of workers)	0.07%	0.22%	0.39%	0.50%	0.54%	0.56%	0.56%	0.55%
-low	0.12%	0.39%	0.71%	0.94%	1.03%	1.07%	1.05%	1.03%
-medium	0.06%	0.18%	0.31%	0.40%	0.43%	0.46%	0.47%	0.47%
-high	0.08%	0.21%	0.36%	0.46%	0.49%	0.50%	0.48%	0.47%
Unemployment rate (change in pp)	0.02	0.07	0.09	0.08	0.05	0.02	0.01	0.01
-low	0.05	0.14	0.19	0.16	0.09	0.02	0.02	0.01
-medium	0.01	0.04	0.05	0.04	0.02	0.00	0.00	0.00
-high	0.02	0.07	0.10	0.09	0.06	0.03	0.02	0.01
Real net wages	0.00%	-0.10%	-0.18%	-0.22%	-0.20%	-0.18%	-0.15%	-0.14%
-low	-0.05%	-0.21%	-0.36%	-0.41%	-0.39%	-0.36%	-0.33%	-0.32%
-medium	0.01%	-0.04%	-0.08%	-0.10%	-0.08%	-0.07%	-0.06%	-0.05%
-high	0.00%	-0.11%	-0.23%	-0.27%	-0.26%	-0.22%	-0.16%	-0.13%
Employment (no. of workers) - Natives	0.00%	-0.02%	-0.04%	-0.04%	-0.03%	-0.02%	-0.01%	0.00%
-low	-0.04%	-0.12%	-0.18%	-0.20%	-0.19%	-0.19%	-0.18%	-0.18%
-medium	0.00%	0.00%	0.00%	0.01%	0.03%	0.05%	0.07%	0.08%
-high	0.00%	-0.02%	-0.04%	-0.05%	-0.05%	-0.05%	-0.06%	-0.06%
Real net wages - Natives	0.01%	-0.06%	-0.11%	-0.13%	-0.12%	-0.10%	-0.08%	-0.07%
-low	-0.03%	-0.15%	-0.25%	-0.28%	-0.26%	-0.25%	-0.23%	-0.22%
-medium	0.02%	-0.01%	-0.03%	-0.04%	-0.02%	-0.02%	-0.01%	-0.01%
-high	0.01%	-0.08%	-0.17%	-0.21%	-0.19%	-0.16%	-0.11%	-0.09%
Sending Countries	yr1	yr2	yr3	yr4	yr5	yr7	yr9	yr10
Real GDP	-0.12%	-0.26%	-0.44%	-0.60%	-0.71%	-0.82%	-0.86%	-0.88%
Investment, real	-0.96%	-0.98%	-1.00%	-1.05%	-1.10%	-1.13%	-1.12%	-1.11%
Private consumption, real	-0.18%	-0.37%	-0.59%	-0.74%	-0.80%	-0.87%	-0.90%	-0.91%
Employment (no. of workers)	-0.12%	-0.34%	-0.61%	-0.81%	-0.92%	-0.99%	-0.98%	-0.98%
-low	-0.11%	-0.30%	-0.55%	-0.74%	-0.85%	-0.92%	-0.90%	-0.88%
-medium	-0.12%	-0.33%	-0.59%	-0.79%	-0.89%	-0.96%	-0.95%	-0.95%
-high	-0.14%	-0.41%	-0.71%	-0.94%	-1.04%	-1.13%	-1.13%	-1.13%
Unemployment rate (change in pp)	-0.06	-0.16	-0.22	-0.19	-0.10	-0.02	0.00	0.00
-low	-0.05	-0.13	-0.19	-0.16	-0.08	-0.01	0.00	0.01
-medium	-0.06	-0.16	-0.22	-0.19	-0.09	-0.01	0.00	0.01
-high	-0.07	-0.19	-0.27	-0.25	-0.14	-0.05	-0.04	-0.04
Real net wages	-0.04%	0.06%	0.17%	0.23%	0.23%	0.19%	0.14%	0.11%
-low	-0.05%	0.01%	0.06%	0.09%	0.07%	0.03%	-0.02%	-0.05%
-medium	-0.05%	0.04%	0.13%	0.18%	0.17%	0.14%	0.09%	0.07%
-high	-0.03%	0.15%	0.34%	0.45%	0.47%	0.44%	0.37%	0.34%

Table 2: Aggregate Simulation Results; Migration of 1% of Sending Countries Labour Force
Source: Model Simulations PuMA.

Sensitivity Scenario					Main Scenario				
	in % of working age population					in % of working age population			
Sending Countries	Low	Medium	High	Total	Sending Countries	Low	Medium	High	Total
ES	1.4%	0.9%	0.6%	1.0%	ES	1.0%	1.0%	1.0%	1.0%
IT	1.3%	0.9%	0.6%	1.0%	IT	1.0%	1.0%	1.0%	1.0%
Total	1.3%	0.9%	0.6%	1.0%	Total	1.0%	1.0%	1.0%	1.0%
Receiving Countries	Low	Medium	High	Total	Receiving Countries	Low	Medium	High	Total
AT	1.82%	0.35%	0.22%	0.52%	AT	1.41%	0.37%	0.37%	0.52%
BE	2.05%	0.77%	0.40%	0.94%	BE	1.56%	0.81%	0.67%	0.94%
DE	2.26%	0.33%	0.31%	0.58%	DE	1.73%	0.35%	0.52%	0.58%
FI	0.84%	0.12%	0.08%	0.19%	FI	0.63%	0.13%	0.13%	0.19%
FR	1.50%	0.43%	0.27%	0.59%	FR	1.14%	0.45%	0.45%	0.59%
NL	1.04%	0.31%	0.20%	0.43%	NL	0.79%	0.33%	0.33%	0.43%
Total	1.74%	0.37%	0.28%	0.58%	Total	1.33%	0.39%	0.46%	0.58%

Classification of educational levels according to ISCED 2011: low (ISCED 0-2), medium (ISCED 3-4), high (ISCED 5+).

Table 3: Sensitivity Analysis: Skill Distribution - Number of Additional Migrants
Source: own calculations based on Eurostat

Total	yr1	yr2	yr3	yr4	yr5	yr7	yr9	yr10
Real GDP	0.00%	-0.01%	-0.01%	-0.01%	-0.01%	-0.01%	-0.01%	-0.01%
Investment, real	-0.02%	-0.03%	-0.03%	-0.03%	-0.03%	-0.02%	-0.02%	-0.02%
Private consumption, real	-0.01%	-0.01%	-0.01%	-0.01%	-0.01%	-0.01%	-0.01%	-0.01%
Employment (no. of workers)	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Unemployment rate (change in pp)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Real net wages	0.00%	0.00%	0.00%	0.01%	0.01%	0.00%	0.00%	0.00%
Receiving Countries	yr1	yr2	yr3	yr4	yr5	yr7	yr9	yr10
Real GDP	-0.01%	-0.02%	-0.04%	-0.05%	-0.05%	-0.05%	-0.06%	-0.06%
Investment, real	-0.07%	-0.09%	-0.09%	-0.09%	-0.09%	-0.09%	-0.08%	-0.08%
Private consumption, real	-0.02%	-0.02%	-0.03%	-0.04%	-0.04%	-0.04%	-0.04%	-0.04%
Employment (no. of workers)	-0.01%	-0.02%	-0.02%	-0.03%	-0.03%	-0.03%	-0.03%	-0.03%
Unemployment rate (change in pp)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Real net wages	0.00%	0.01%	0.02%	0.02%	0.02%	0.02%	0.02%	0.01%
Sending Countries	yr1	yr2	yr3	yr4	yr5	yr7	yr9	yr10
Real GDP	0.02%	0.04%	0.05%	0.07%	0.08%	0.09%	0.09%	0.09%
Investment, real	0.12%	0.13%	0.14%	0.15%	0.16%	0.16%	0.15%	0.15%
Private consumption, real	0.01%	0.03%	0.04%	0.05%	0.05%	0.05%	0.06%	0.06%
Employment (no. of workers)	0.02%	0.03%	0.04%	0.05%	0.06%	0.06%	0.06%	0.06%
Unemployment rate (change in pp)	0.00	0.00	-0.01	-0.01	-0.01	-0.02	-0.02	-0.02
Real net wages	0.00%	-0.01%	-0.02%	-0.03%	-0.03%	-0.03%	-0.02%	-0.02%

Table 4: Sensitivity Analysis: Skill Distribution and Main Scenario - Difference in Outcome
Source: Model Simulations PuMA.

Receiving Countries	yr1	yr2	yr3	yr4	yr5	yr7	yr9	yr10
Real net wages	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
-low	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.02%
-medium	0.00%	0.00%	0.00%	0.00%	0.01%	0.01%	0.01%	0.01%
-high	-0.01%	-0.01%	-0.01%	-0.01%	-0.01%	-0.02%	-0.02%	-0.03%
Real net wages - Natives	-0.01%	0.00%	0.02%	0.03%	0.03%	0.03%	0.04%	0.04%
-low	0.00%	0.03%	0.06%	0.08%	0.08%	0.08%	0.09%	0.09%
-medium	-0.01%	0.00%	0.01%	0.02%	0.03%	0.04%	0.04%	0.05%
-high	-0.01%	0.00%	0.02%	0.02%	0.02%	0.02%	0.01%	0.01%

Table 5: Sensitivity Analysis: Complementarity and Main Scenario - Difference in Real Net Wages
Source: Model Simulations PuMA.

Total	yr1	yr2	yr3	yr4	yr5	yr7	yr9	yr10
Real GDP	0.00%	-0.01%	-0.01%	-0.02%	-0.02%	-0.02%	-0.03%	-0.03%
Investment, real	-0.03%	-0.02%	-0.02%	-0.02%	-0.02%	-0.02%	-0.02%	-0.02%
Private consumption, real	-0.01%	-0.02%	-0.02%	-0.02%	-0.03%	-0.03%	-0.03%	-0.02%
Employment (no. of workers)	-0.01%	-0.01%	-0.02%	-0.02%	-0.02%	-0.03%	-0.03%	-0.03%
Unemployment rate (change in pp)	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Real net wages	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Receiving Countries	yr1	yr2	yr3	yr4	yr5	yr7	yr9	yr10
Real GDP	0.01%	0.00%	-0.01%	-0.02%	-0.02%	-0.03%	-0.03%	-0.03%
Investment, real	-0.07%	-0.07%	-0.06%	-0.06%	-0.06%	-0.06%	-0.06%	-0.06%
Private consumption, real	0.01%	0.00%	0.00%	-0.01%	-0.01%	-0.01%	-0.02%	-0.02%
Employment (no. of workers)	0.01%	0.00%	0.00%	-0.01%	-0.01%	-0.01%	-0.02%	-0.02%
Unemployment rate (change in pp)	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01
Real net wages	-0.02%	-0.01%	-0.01%	-0.01%	-0.02%	-0.02%	-0.02%	-0.02%
Sending Countries	yr1	yr2	yr3	yr4	yr5	yr7	yr9	yr10
Real GDP	-0.03%	-0.03%	-0.02%	-0.02%	-0.02%	-0.02%	-0.01%	-0.01%
Investment, real	0.09%	0.09%	0.09%	0.09%	0.09%	0.09%	0.09%	0.09%
Private consumption, real	-0.07%	-0.07%	-0.06%	-0.06%	-0.06%	-0.05%	-0.04%	-0.04%
Employment (no. of workers)	-0.04%	-0.04%	-0.04%	-0.04%	-0.05%	-0.05%	-0.06%	-0.06%
Unemployment rate (change in pp)	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Real net wages	0.03%	0.04%	0.04%	0.04%	0.05%	0.05%	0.06%	0.06%

Table 6: Sensitivity Analysis: Complementarity and Main Scenario - Difference in Outcome
Source: Model Simulations PuMA.

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