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Replacement migration from a labour market perspective

Germany's long-term potential labour force and immigration from non-EU member countries

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Abstract

We quantify the development of the potential labour force in Germany from 2014 to 2050 and pose the question as to which extent migration will be able to offset the well-known negative demographic influence. The mean overall results of this long period of time show that while migration may slightly dampen the trend, it cannot fully compensate for it, depending on the development of domestic labour participation. Persistently high immigration numbers, however, will defer the demographic caused decline of the workforce for some years. In contrast, even high, if realistic, immigration flows will only slow down demographic ageing.

Zusammenfassung

Im Zuge des demographischen Wandel wird die Zahl der dem Arbeitsmarkt zur Verfügung stehenden Personen sichtbar schrumpfen, während die Rentnerzahl deutlich zunimmt. Die Autoren quantifizieren die Entwicklung des Erwerbspersonenpotenzials in Deutschland bis 2050 und fragen, inwiefern Migration dieser Schrumpfung entgegenwirken kann. Ausgangspunkt der Berechnungen sind die aktuellen hohen Zuwanderungszahlen. Im Ergebnis zeigt sich, dass in der langen Frist Zuwanderung den demografisch bedingten Rückgang des Erwerbspersonenpotenzials zwar deutlich reduziert, aber eine vollständige Kompensation kaum möglich ist. Nur bei anhaltend hohen Nettozuzügen aus Nicht-EU-Staaten würde das Arbeitskräfteangebot bis 2025 sogar steigen und erst danach sinken, so dass es erst um das Jahr 2030 herum unter das gegenwärtige Niveau fällt. Im Gegensatz zur absoluten Entwicklung des Erwerbspersonenpotenzials können realistisch hohe Migrationsströme die demografische Alterung, gemessen am Altenquotienten, nur abschwächen.

1 Introduction[1]

Demographic change will have a lasting impact on the German labour market which will become evident in many different ways (Schneider 2011). One conceivable trend concerns the potential labour force, which will decline substantially in the next few decades if the status quo remains unchanged. The reasons are, firstly, that the baby-boom generation is gradually reaching retirement age and, secondly, the low birth rates among the subsequent cohorts. The magnitude of the problem becomes clear when we think about the fact that in 2014, only half as many children were born (715,000) than in 1964, the peak of baby boomers in post-war Germany.

As labour supply is one of the determinants of an economy's growth potential, a declining labour force potential alone could result in weaker economic growth (SVR 2014).[2] It also puts the financial foundation of social security systems into jeopardy, because the shrinking labour supply finds itself opposite an increasing number of retirees. In addition, studies warn against substantial shortages of skilled workers (e. g. McKinsey 2011; Prognos 2012), even though a declining potential labour force could lead to a reduced demand for labour. These apprehensions lead one to conclude that measures to counteract the trend towards a shrinking potential labour force at a socially reasonable cost are a pressing economic requirement (Federal Employment Agency 2011). With that in mind, this article will look at immigration as a possible adjusting factor that helps us to stem the declining potential labour force in the German economy. Before that, however, the shrinkage in question must be quantified using different scenarios of future labour participation.

Besides, with regard to immigration it must be distinguished between EU mobility, which can hardly be politically controlled, and migration from non-EU member states (third countries). Currently, the economic effects of the declining birth rate are being cushioned by strong immigration. The article at hand draws on that fact and shows that the current level of EU immigration will not last in the long run. Hence, migrants from EU member states will hardly be available as a source of sustainable stabilisation of the German labour market and the social security systems. Therefore, this article also discusses migration from third countries as an alternative reservoir of additional workers.

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[1] This article is based on up-dated results of a study financed by the Bertelsmann Foundation; see Fuchs/Kubis/Schneider (2015). The views and opinions expressed in this article are solely those of the authors and do not necessarily reflect the views of the Bertelsmann Foundation.

[2] Of course, this growth inhibitor could be met with an accordingly high *acceleration* of labour productivity growth, so that the increase of per-capita income with population figures continually declining would be even greater. But it is questionable whether such an increase in innovation speed is realistic in an ageing economy (Schneider 2011).

2 Forecasting the potential labour force

2.1 Definitions and methodology

"Potential labour force" is used in the following to mean the sum of the currently employed, the unemployed, and the hidden labour force. It nearly constitutes the upper limit of labour supply. The potential labour force is restricted to individuals between 15 and 74 years of age, which means that it also includes workers older than 64 years. Due to the inclusion of the hidden labour force, the scope of the potential labour force does not depend as strongly on the economic situation as the number of gainfully employed persons does. That makes it better suited for long-term projections. Our forecast of labour supply until 2050 links a population projection with a projection of labour participation. Accordingly, the labour force participation rates are structured by age and gender and multiplied by the corresponding population figure of the year in question. Apart from the two factors age and gender, the model also distinguishes between German nationals and foreigners. This accounts above all for well-known differences in labour participation of German and foreign women.

We use the cohort-component methodology in projecting the population (e. g. Rowland 2003). The population model used here was developed by the Institute for Employment Research (IAB) and then updated and adjusted in accordance with the research question (see Fuchs/Söhnlein 2005 and 2013). Our calculation refers to the population as of 31 December 2013 as the base population. The full further development then results from the age-, gender- and nationality-specific changes due to births, deaths, and migration.[3] A total fertility rate of 1.367 children per German mother and 1.798 children per foreign mother is assumed for the forecast period. Regarding mortality, it is assumed that life expectancy continues to grow, resulting in an increase for newborns to 83.9 years for boys and 88.3 years for girls by 2050. Concerning migration, a number of scenarios with different migration flows are examined, including a scenario without any migration.[4] The preliminary data of the official migration statistic (emigration and immigration by age and gender and differentiated by German and foreign nationals) were already available for 2014.[5] These distributions were held constant over the forecast period.[6]

The information on labour participation is based on the updated data and forecasts by Fuchs/Söhnlein/Weber (2011). Data version is as of 2014 (see Appendix). The labour force participation rates used are actually potential labour force participation rates: the gainfully employed plus the unemployed plus the hidden labour force with

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[3] The model also includes an annual naturalisation rate of 1.5 per cent of the foreign population.

[4] As for the rest, all migration scenarios assume a net migration of -10,000 for German nationals in 2015 and after that, zero. As the net migration of Germans has always been negative in the past decade, this is an optimistic assumption for our scenarios.

[5] We therefore consider the year 2014 as a preliminary baseline.

[6] The comprehensive population data base is available upon request.

reference to the according demographic group. In this paper the term labour partici-pation rates refers to potential labour force rates.

A status quo scenario projects the current labour participation rates forward until 2050 without any adjustments. This renders this scenario rather unrealistic, but it allows us to depict those changes in the potential labour force which are solely caused by demographics. In the realistic scenario, the past trends are being project-ed forward, especially the increasing labour participation of women. Moreover, the impact of the postponement of the statutory retirement age (pension at 67[7]) be-comes evident through higher participation rates among older people. The extreme scenario takes it one step further and assumes an extreme increase in labour partic-ipation rates, consisting mainly of three elements: equalisation of participation rates between German men and women, adjustment of the participation rate of foreign women to the German level, and an even stronger increase in labour participation of older people based on retirement at 70.

2.2 Projection of the potential labour force until 2050 – scenarios without migration

For comparison purposes, the forecast of the potential labour force is initially done based on demographic development without immigration. Figure 1 shows the effects of demographic development as a function of the assumed development in labour participation (status quo, realistic increase, extreme increase). All scenarios clearly show a downward trend.

Figure 1
Potential labour force until 2050, without immigration
Annual averages in thousands
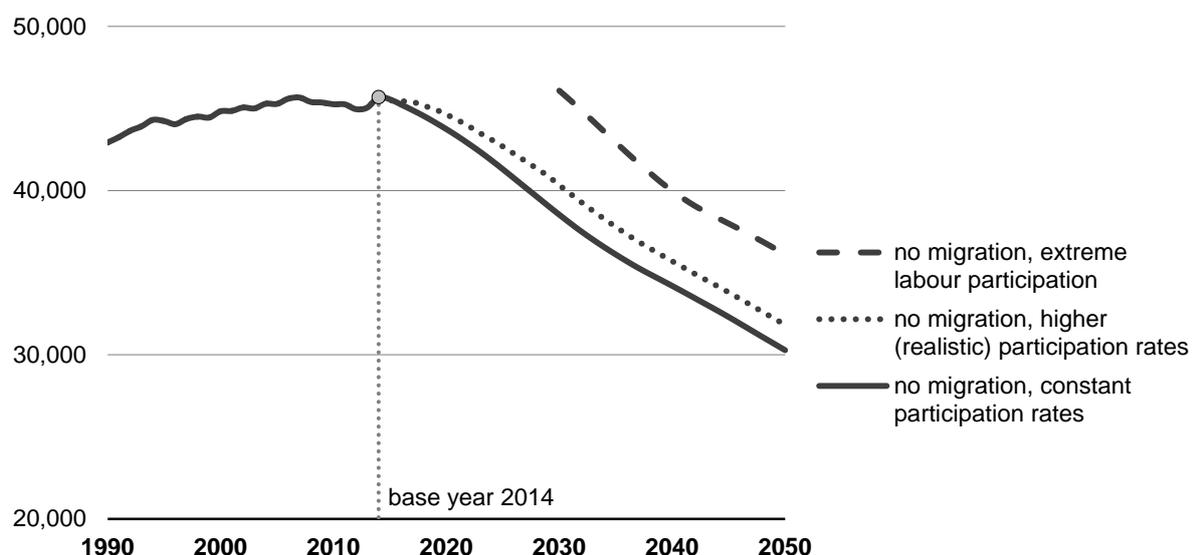
Source: Own calculations.

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[7] Germany has introduced a progressive increase in the statutory retirement age. The scheme will come to an end by 2029. The future legal retirement age will be 67 years of age.

In the status quo scenario, which assumes that the current labour participation rate remains constant and does not continue or adapt any possible trends regarding the labour force behaviour of women and older people, the labour force potential would decline by almost 15.4 million people, based on the assumed, easy-to-forecast demographic development between 2014 and 2050; more precisely, a decline by 33.7 per cent, from 45.7 million to 30.3 million.

The realistic scenario, which takes increasing labour participation into consideration, results in an additional potential of a good 1.5 million workers by 2050. This shows that the behavioural effect from higher participation rates counteracts the demographic effect only to a very limited extent. It carries a lot of weight that the baby-boom generation – whose labour participation rates should increase, in some cases even dramatically, within the forecast period due to the increase of the statutory retirement age – will start retiring from employment around 2025. This will afterwards weaken the positive influence of increasing labour participation on the labour force potential.

In the scenario with an extreme increase of labour participation rates among German women, foreign women, and older people, a tendency to shrink at a similar pace becomes apparent; this one, however, at a significantly lower level. Figure 1 merely illustrates the effects of extremely increased labour participation after 2030. Before that year, the underlying behavioural changes would be so phantasmal that we decided against a depiction.

Table 1 differentiates the effects of extreme behavioural changes for the years 2035 and 2050. If the same labour participation rates applied to women aged 30–59 as to men of the same age bracket, the resulting potential labour force for the year 2035 would be 340,000 people more than in the realistic scenario. By 2050, this difference will shrink to 220,000.[8] When we assume equal labour participation rates for both German and foreign women, this would result in an enhancement of 560,000 female workers by 2035. In 2050, this gain would be less than 480,000 workers.

The greatest effect is generated by older people remaining in employment longer. A retirement age of 70 leads to a potential labour force which, by 2035, is 4.2 million people more than in the realistic scenario. By 2050, this increase will be reduced to 3.6 million. Besides, at this point in time, almost every second person (46 %) of the labour force would be at least 50 years old. The results show therefore that even a massive expansion of labour force participation will not be able to stop the demographic effect on the potential labour force in the long run; if anything, it may mitigate the effect for a period of time. This leads us to the question as to which extent immigration is able to counteract this declining labour supply.

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[8]   The decreasing population of working age will partly offset the effect of rising participation rates.

Table 1

The impact of extremely increased labour participation rates on the potential labour force in 2035 and 2050 (scenarios without migration)

Thousands

	Potential labour force in the realistic scenario	Potential labour force assuming extremely increased labour participation		
		Equal labour participation of German men and women (aged 30–59 years)	Equal labour participation of German and foreign women (aged 15-59 years)	Retirement at 70
2014*	45,695			
2035	37,792	38,133	38,352	42,036
2050	31,821	32,044	32,259	35,439

* 2014 preliminary.

Source: Own calculations.

3 Migration effects

3.1 Labour force trends including an EU immigration forecast

Background and model

Even though our perspective might be a little off at the moment due to the current influx of asylum seekers, it can still be stated that the strongly increased immigration to Germany over the past five years is mainly due to migrants from other EU member states. Especially the two EU enlargements in 2004 and 2007 as well as the gradual introduction of free movement of workers made an impact. In addition, the economic crisis in many EU member states caused more of their citizens to emigrate. Even in 2014, 60 % of immigrants to Germany still came from another EU member state.[9] There is evidence, however, that this development will be rather short-term and that migration balances around the European countries will settle once again in the long run (Bertoli et al. 2013). Firstly, the one-time effect of the eastward enlargement will soon wear off significantly. Secondly, the convergence process on the European level, slow as it may be, is supposed to reduce people's disposition to emigrate from the (South) Eastern European member states and inspire a willingness to return in citizens living abroad. Thirdly, the demographic situation in many EU member states should be an inhibitor to the migration potential.

In order to make a long-term estimate regarding European immigration, we will resort to an econometric migration model, which is based on common concepts found in literature (e. g. Brücker/Silverstovs 2006). The estimation process involves specifying a migration flow panel model of the age-specific migration rates to/from Germany with fixed time and country effects, where immigration to and emigration from Germany are estimated separately. Explanatory variables in use are the relation of per-capita income between the country of origin and the destination as well as the

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[9] See the website of the Federal Statistical Office, www.destatis.de. All population data as well as migration data used are freely available online.

unemployment rate of the countries of origin (immigration) and, respectively, the destinations (emigration). Moreover, indicator variables are added, showing whether the respective country was already a member of the EU in the corresponding year and whether free movement has already been granted. With respect to immigration to Germany, the following equation is estimated for every of the available five age groups:

$$log(m_{it}) = \beta_1 log(Y_{it-1}) + \beta_2 log(U_{it-1}) + \beta_3 EU_{it} + \beta_4 FREE_{it} + \mu_i + d_t + \varepsilon_{it} \qquad (1)$$

Here, m_{it} represents migration rate, i.e. the population weighted number of migrants of a specific age group moving from country i to Germany during the year t. Y_{it-1} measures the relation of per-capita income between Germany and the source country i at time $t-1$; U_{it-1} is the unemployment rate in the sending country at time $t-1$. The dummy variables EU_{it} and $FREE_{it}$ are set to one if the source country i is member of the EU and, respectively, the free movement of workers from EU-member countries to Germany is not restricted. μ and d represent country and time specific fixed effects. The emigration equation is estimated in analogously.

Migration data are provided by the Federal Statistical Office. The data concerning per-capita income, unemployment, population and age structure in the EU member states are taken from Eurostat. For data reasons, the model is estimated for the EU-27 (i. e. without Croatia). The sample used covers the period 2004 to 2012.

The results are presented in Table 2 for the immigration to Germany and in Table 3 for the emigration from Germany. A positive coefficient implies a positive influence of the particular variable with respect to the immigration or emigration rate.

Our model allows to differentiating inflows and outflows. This uncovers some surprising results.

Unemployment raises the immigration as well as the emigration rates. But the net effect of Table 2 and 3 for the unemployment rate is in accordance with the theoretically expectations, i. e. a comparatively higher unemployment abroad raises net migration to Germany.

Similarly the coefficients for the GDP should be evaluated together. This shows that a deterioration of the income abroad increases the net migration to Germany.

Not surprisingly, for almost all age groups the EU-membership as well as the free movement of workers has a positive effect. As this work in both directions, from and to Germany, the results can be explained with the importance of circular and temporary migration. The different, mostly insignificant results for the elderly may be seen on the same background, as for older people permanent reasons should be more important.

Table 2
Immigration from EU-countries to Germany, 2004–2012
Panel regressions for the age-specific immigration rate

	Age group				
	0-17	**18-24**	**25-49**	**50-64**	**65+**
Log (GDP per capita Germany / country of origin)	-0.773	0.512	-0.502	-2.009***	-1.747***
Log (unemployment rate in the country of origin, in per cent)	0.675***	0.313***	0.701***	0.922***	0.430***
EU	1.630***	1.299***	1.230***	0.675***	0.181
FREE	0.328***	0.278***	0.197***	0.290***	0.127
R²	0.945	0.970	0.969	0.957	0.952

Notes: Each column represents an estimate for the particular age group from a country-specific panel model with data for the EU-27 countries. Sample period 2004-2012.
Dependent variable is the immigration rate for the age group, defined as the number of immigrants to Germany in the year t related to the population of the same age in the country of origin.
EU and FREE are indicator variables taking the value 1 when EU-membership respectively Free movement were given and 0 otherwise.

***, **, * indicate significance at 1 %, 5 %, 10 % level respectively.

Source: Own calculations.

Table 3
Emigration from Germany to EU-countries, 2004–2012
Panel regressions for the age-specific emigration rate

	Age group				
	0-17	**18-24**	**25-49**	**50-64**	**65+**
Log (GDP per capita country of destination / Germany)	2.091***	-0.406	1.099**	3.413***	1.726***
Log (unemployment rate in the country of destination, in per cent)	0.257*	0.067	0.399***	0.718***	0.170
EU	0.834***	0.860***	0.675***	0.126	-0.381**
FREE	0.290***	0.140**	0.204***	0.265**	-0.007
R²	0.965	0.987	0.986	0.978	0.980

Notes: Each column represents an estimate for the particular age group from a country-specific panel model with data for the EU-27 countries. Sample period 2004-2012.
Dependent variable is the immigration rate for the age group, defined as number of emigrant from Germany in year t related to the population of the same age in the country of origin.
EU-membership and Free movement are indicator variables taking the value 1 when EU-membership respectively Free movement were given and 0 otherwise.

***, **, * indicate significance at 1 %, 5 %, 10 % level respectively.

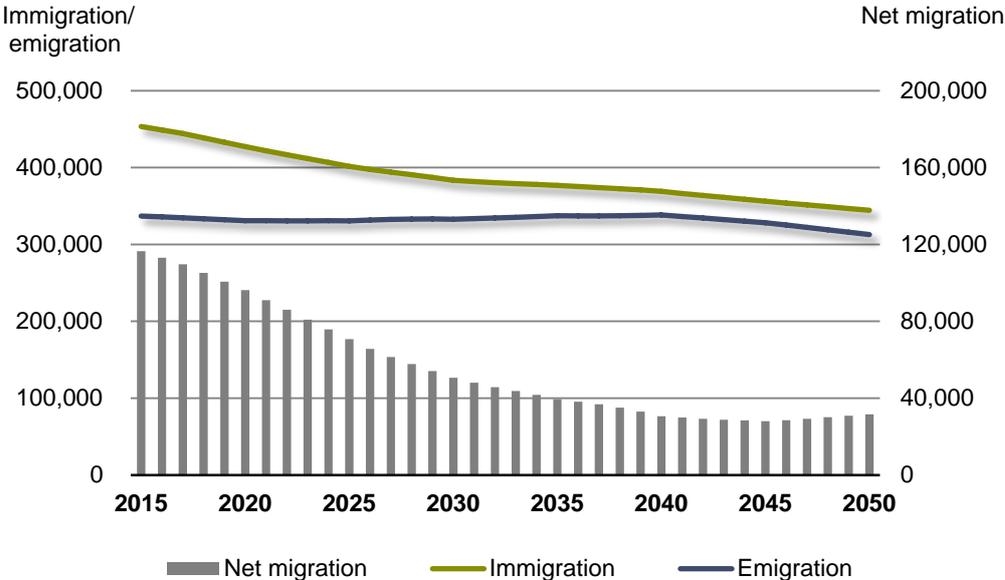Source: Own calculations.

Projection of the EU immigration to Germany, 2015-2050

Based on the estimated model and both demographic and economic long-term projections by Eurostat (2013) and the European Commission (2012), the EU-related migration movements to and from Germany can be quantified until 2050. Figure 2 illustrates the projected immigration and emigration movements for Germany across

the entire 2015–2050 period and the resulting net migration. According to the figure, immigration in the forecast period decreases clearly while emigration remains rather stable. On balance, this results in a strongly falling migration gain from roughly 120,000 at the start of the forecast horizon to approx. 30,000 from the year 2040 onwards. The mean annual net migration across the entire period is approx. 56,000 people.

In alternative scenarios which assume a slightly better or slightly worse economic and labour market development in Germany's EU partner countries, the result is a mean net migration between 42,000 and 70,000 per year, i. e. the model forecasts in the most favourable case on average 70,000 people moving to Germany every year from other EU member states. In the least favourable case, that migration surplus would be only 42,000 per year. In other words, the immigration potential from the other EU member states will run out in the medium and long term.

Figure 2
Migration between Germany and the EU, 2015-2050
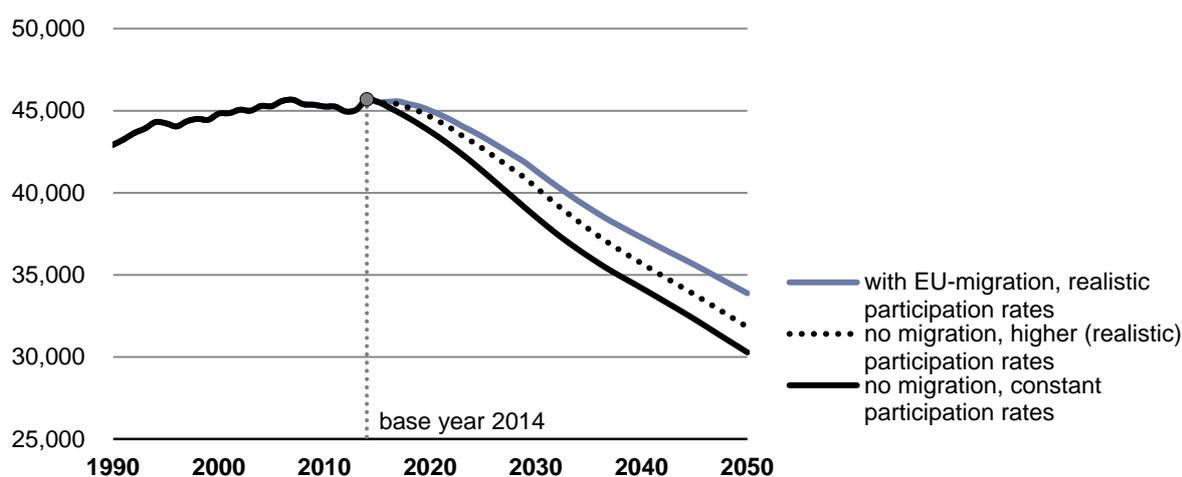

Source: Own calculations.

Our model clearly underestimates the present immigration flows from the EU, not least because the restrictive sample period, which ends already in 2012, thus not sufficiently reflecting the full effect of the free movement regulations. However, this disadvantage should not carry any more weight in the medium and long term. On the contrary: too much weight on the estimate of the current EU immigration figures would unduly perpetuate the current one-time effect of the EU enlargement.

3.2   Potential labour force to 2050 including EU migration

According to our projection, the immigration potential from the other EU member states will thus run out almost completely in the medium and long term. What this means for the development of the potential labour force in Germany becomes clear

when we start by omitting immigration from third countries from our realistic scenario projections, i.e. we calculate the forecast without taking into consideration any immigration from countries outside of the EU (Figure 3). Net immigration would therefore be a little lower than in the past and also considerably lower than it is at the moment. If only citizens of EU member states moved to Germany, this would result in a declining potential labour force in Germany which would only be slightly milder than in the realistic scenario without immigration.

Figure 3
Potential labour force until 2050 – including EU migration
Annual averages in thousands

Source: Own calculations.

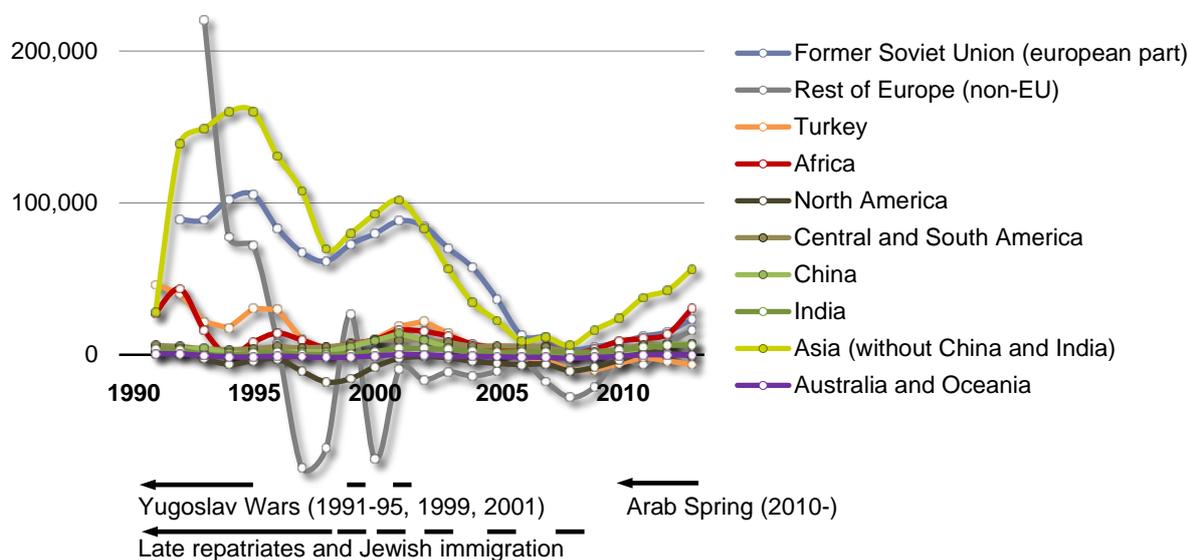## 3.3   Scenarios for third-country immigration

Apart from the recently dominating immigration from EU member states, there are also people coming to Germany from countries which are not part of the European Union (third countries). They, too, can help to offset the decline in the potential labour force caused by demographic change. Immigration from third countries has been front and centre in recent debate (e. g. Brücker 2015).

The immigration flow from third countries can be divided into three major blocks: direct immigration to the labour market, immigration for study or vocational training purposes, and the group of asylum seekers and refugees, which has recently grown substantially. Within the current institutional framework, however, only some of these migrants will be available to the labour market.

Third-country immigration over the last 25 years shows extreme fluctuation (Figure 4). This applies to both time and the countries these people come from. Singular events such as the fall of the Iron Curtain and the resulting immigration of late repatriates, the Yugoslav Wars in the early 1990s, or the current crises and conflicts in the Arab and African worlds dominate immigration during certain periods. Against this backdrop, a reliable model-based projection of immigration flows is problematic

at best. Moreover, the influx strength is also influenced by the respective immigration law stipulations.

Figure 4
Net migration from third countries by region of origin, 1991-2013

Source: Own depiction based on data by the Federal Statistical Office.

In order to illustrate the effect which the expected immigration from third countries has on the potential labour force, we drew up two scenarios based on the immigration flows of the last 20 years (Table 4). As a rule, approaching the question of expected future immigration from third countries always involves a great degree of uncertainty. Therefore, the scenarios 1 and 2 at hand are to be understood as a thought experiment rather than a forecast (see Figure 5).

Since the current margin is dominated by a high immigration rate from crisis-ridden states, it is assumed for the year 2015 that the immigration of non-Germans without asylum will remain at the same level as the previous year but that the influx of asylum-seekers will rise to 800,000 people.[10] Usually, emigration rates rise as immigration levels increase, which is why we are also expecting a moderate rise there. In both scenarios, this high immigration level will continue in the subsequent year of 2016.

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[10]   Regarding the influx of 800,000 asylum seekers, it is assumed that a great number of the refugees will leave Germany again in the same year.

Table 4
Immigration from third countries

	Immigration	Emigration	Net immigration
1996	393,775	271,912	121,864
2000	361,719	316,368	45,351
2005	259,296	224,523	34,773
2010	279,070	224,155	54,915
2015*	1,183,734	300,000	883,734
1996–2015	375,359	263,808	111,550
2013–2015	*715,459*	*289,975*	*425,485*

Notes: 2015 own estimate (as of October 2015).
Only foreigners (i. e. no migrations of German nationals from/to abroad)
Source: Federal Statistical Office, own calculations.

The past shows that such immigration peaks decline in the medium term. In Scenario 1, we assume an immigration level for the years 2017 to 2019 which corresponds to the average of the years 2013 to 2015. On the one hand, this may be explained by the fact that crises are usually resolved in the short or medium term. On the other hand, however, one may also observe institutional adjustments in the destination country as a direct consequence of a very high immigration flux (like the introduction of the third-country rule in Germany). In the long term, we are expecting further alignment with the long-term average. For the years 2020 to 2030, we are therefore conducting a linear adjustment to the average of the last 20 years (1996–2015).

Figure 5
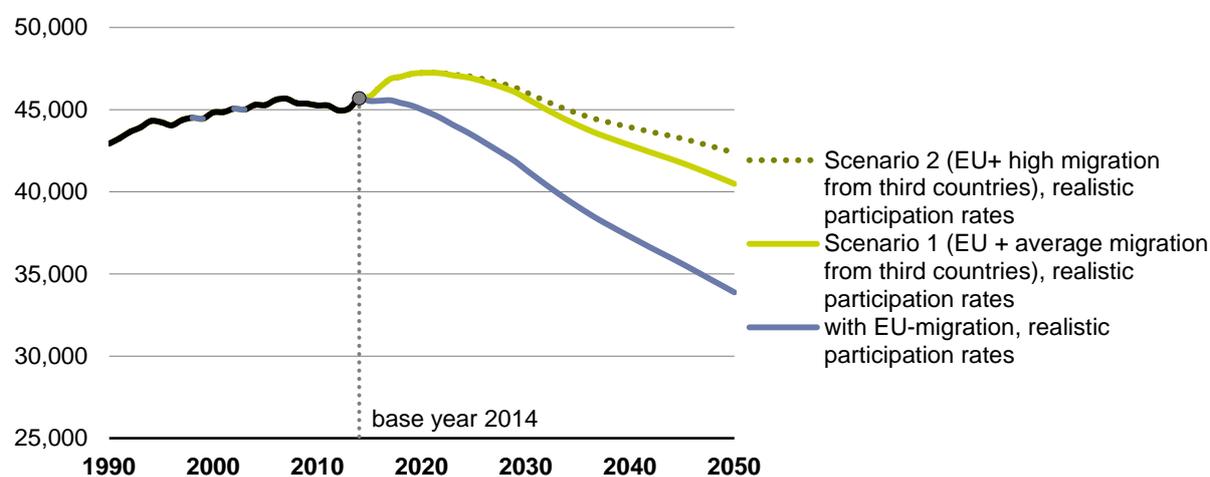**Two scenarios of future third-country migration**
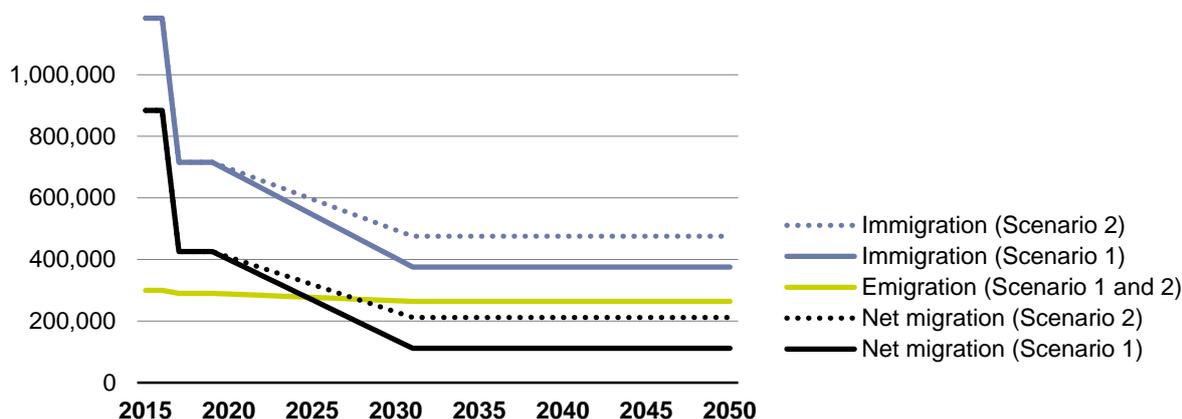
Source: Own calculations.

Since it is possible that we are currently observing a structural change in our immigration regime, a second scenario with higher net migration inflows is examined. In Scenario 2, the already calculated mean benchmark values are therefore raised by 100,000 people.

For the development already depicted in Figure 3, third-country immigration is modelled on top of it. In both scenarios, the decline in the potential labour force stated earlier turns out to be less dramatic (Figure 6).

Figure 6
Potential labour force until 2050 with migration from third countries
Annual averages in thousands

Scenario 2 (EU+ high migration from third countries), realistic participation rates

Scenario 1 (EU + average migration from third countries), realistic participation rates

with EU-migration, realistic participation rates

base year 2014

Source: Own calculations.

4   Consequences for the old-age dependency ratio

An undisputed challenge that comes with a shrinking potential labour force and which we have already touched upon concerns the financial feasibility of social security systems (and in principle also other responsibilities of the state, such as infrastructure). When the number of workers decreases, the burden imposed on the individual by taxes and duties would increase accordingly, especially due to demographic ageing. A shrinking potential labour force could therefore seriously jeopardise the social security systems.

A commonly used indicator to illustrate this funding problem is known as the "old-age dependency ratio," which puts the older population (e. g. aged 65+) in relation to the population of working age (e. g. aged 20–64).[11] Since not all people of working age are also "close to the labour market" or, indeed, gainfully employed, it would seem reasonable to use the potential labour force instead, because in case of "full-employment" it corresponds to the number of gainfully employed people.

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[11]   The age limits for the old-age dependency ratio have been set inconsistently. Therefore, the way in which the ratio changes is actually more important than its absolute value (i. e. the level).

The indicator stated in Table 5 may be understood as the old-age dependency ratio modified to fit the purpose, because it is closer to the funding of the systems than it would be to use the working-age population.[12]

Table 5
Modified old-age dependency ratio for different scenarios, 1995-2050
Relation in 100

	Constant participation rate	Increasing participation rate			
	without migration	without migration	with EU migration	total migration Scenario 1	total migration Scenario 2
1995	30.2				
2005	32.1				
2015	40.1	40.3	39.4	40.0	40.0
2025	51.1	50.0	49.1	45.5	45.4
2035	70.3	68.3	66.0	58.9	58.0
2050	81.7	79.0	74.1	65.0	62.4

Notes: The modified old-age dependency ratio relates the population aged 65+ to the potential labour force aged 20–64. It may be interpreted in the same way as the old-age dependency ratio. Example: In 2005, there were 32 people aged 65 and older per 100 persons of the potential labour force aged 20–64.

The potential labour force was calculated using the respective net migration rate.

Increasing labour force participation rates include an increase due to retirement at 67.

Source: Own calculations.

The development sketched here indicates in all three scenarios (also in those with significant immigration from third countries) a substantial rise in the modified old-age dependency ratio by the mid-2030s, approximately. This is mainly the consequence of baby boomers reaching retirement age. Without migration or changes in behaviour, however, the increase is strongest. When the projected net immigration flows from the EU are included, the process is merely slowed down. Only in the extreme immigration variant, scenario 2, the modified old-age dependency ratio nearly stabilises at the level reached in about 2035.

People live longer, and that is also true for the baby-boom generation, whose cohorts will start to reach retirement age in just a few years. Even high, if realistic, immigration flows obviously cannot stop demographic ageing and the resulting strain on social security systems altogether, only mitigate the effects.

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[12] The slightly modified restriction of the potential labour force to the 20–64 age bracket accounts for the fact that part of the younger potential is often still in vocational training (apprentices, students with jobs) and older workers (65+) often work only marginal part-time, therefore making very low social security contributions.

5   Conclusion

Migration trends will largely determine the extent to which the German labour force shrinks. Without migration the potential labour force is predicted in a realistic scenario to decrease from 45.7 million in 2014 to 37.8 million in 2035 respectively 31.8 million in 2050.

Our calculations show that the decline in potential labour force can be compensated by immigration in the first years of the forecast period. However, migration from EU-countries will presumably play a less important role in the future as population ageing also affects other European countries and economic and social convergence within the EU should lead to a distinctive decrease of EU net migration. In our study, the mean annual net migration across the entire period is only 56,000 people which results in an extra labour force of almost 2.1 million by 2050.

Germany is currently experiencing an immigration flow which will initially cause a significant expansion of labour supply. The initial effect could actually be even higher than described in this study, because the predicted decline of the EU immigration will occur gradually, i. e., in the short term, European immigration will probably stay at its current level.

In addition, for a couple of years migration to Germany from countries outside the EU has substantially risen. It is apparent that this immigration from third countries already today will have a strong effect on labour force growth. In the moderate Scenario 1, immigration from third countries plus EU-countries can compensate the demographic effect until 2030. By 2050, the labour force is estimated to be 40.5 million workers. The additional number of potential workers due to third country immigration in Scenario 1 amounts to almost 8.7 million workers.

The more extreme Scenario 2, with high migrations flows from non-EU countries, yields an additional labour force of 8.5 million workers by 2050, compared to the scenario with EU-migration only. In this case, the decline of the labour force would be largely damped. The predicted potential labour force of almost 42.4 million persons by 2050 is close to current the number of gainfully employed in Germany, which was 43 million in 2015.

Our study provides quantitative information about the number of persons available to the labour market, but it does not provide data whether these persons will be employed or unemployed. For the matching of both sides of the labour market, the qualification of future labour supply on the one hand and labour demand on the other hand would have to be considered. Long-term projections for Germany show a high demand for qualified labour, which can hardly be met by the German labour force without high migration flows (Maier et al. 2015).

As our study concentrates on the supply-side, the results should be carefully interpreted concerning the future labour demand, mainly in view of the controversial dis-

cussion about the consequences of the fourth industrial revolution (Industry 4.0). Historical experience shows that with technological progress the professional world changes, but the total labour demand does not noticeably diminish (see Wolter et al. 2015). Insofar, we are convinced that a shrinking labour force could threaten the economic strength of the German economy.

In addition, despite the currently strong immigration, a distinctive population ageing can be expected in future. Thus, not only less workers but although much more older persons were predicted; for example the modified old-age dependency ratio in Scenario 1 increases from 40 to about 59 until 2035 and again to 65 until 2050.

The growth of the old-age dependency ratio hints at the burdens on gainfully employed people regarding the financial security of pension, health, and nursing care insurance. Just in general, though, one should not forget that a declining number of workers will also have to master infrastructure development, which may require even more resources than today for demographic reasons.

Germany is currently facing a shift in the migration regime. With the exception of the years after the fall of the Iron Curtain, immigration was strongly labour market-oriented and, later, family-oriented. In these days immigration is dominated by humanitarian plight and political persecution. For the challenge of immigration – especially when there is a change of direction, as at the moment, and it is done without recourse to the immigrants being close to the labour market – is to provide the immigrants with a job perspective. Nobody wants migration which ends in unemployment – not the immigrant nor the state and the social security systems. Moreover, in this case migration would not counteract a potential shortage of skilled workers.

But for now it remains unclear how many refugees manage to find gainful employment, how many of them can be (subsequently) qualified for the labour market at a reasonable effort, and how many will be unable to gain a foothold in the short and medium term. If the immigrants are successfully integrated into the labour market, the accompanying increase of the potential labour force will be an economically welcome development.

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Appendix

Table A1
Potential labour force participation rates by Age, Gender and nationality, selected years

In per cent

Age	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74
German men												
2014	38.8	77.2	90.4	98.3	99.0	98.7	99.4	94.3	90.9	72.3	23.9	11.9
2035	37.3	70.9	87.5	99.9	99.9	99.6	99.8	95.2	94.1	81.0	36.4	12.2
2050	37.3	70.9	87.5	99.4	99.9	99.8	99.8	95.2	94.3	81.0	36.1	12.1
German women												
2014	36.4	77.6	87.6	91.7	92.6	93.2	94.0	90.3	81.1	53.3	15.7	6.9
2035	36.4	73.4	87.2	96.3	99.0	97.6	98.8	95.6	83.0	64.1	28.5	7.3
2050	36.4	70.1	87.2	98.4	99.0	98.2	99.4	96.5	84.1	64.9	28.7	7.3
Non-German men												
2014	36.4	80.1	91.5	98.9	99.9	99.9	97.8	97.2	84.4	72.4	16.6	8.0
2035	36.8	80.9	83.7	97.4	99.4	99.9	97.8	96.5	85.3	77.3	30.3	8.1
2050	36.8	80.9	83.7	97.4	99.4	99.9	97.8	96.5	85.3	77.3	30.3	8.1
Non-German women												
2014	35.8	64.4	64.3	63.5	69.6	75.1	72.5	70.9	65.1	40.4	11.2	5.8
2035	35.8	66.3	66.2	66.7	72.2	78.7	74.6	73.1	67.1	50.6	28.4	6.0
2050	35.8	66.3	66.2	68.8	74.0	78.7	74.6	73.1	67.1	50.6	28.4	6.0

Note: Figures indicated in the table refer to the realistic scenario. The extreme scenario can be easily derived from these figures.

Source: IAB FB A2.

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