Increased labor market participation can't do the job of mastering Germany's demographic change in the future

By Karl Brenke and Marius Clemens

In the last decade the available labor force has expanded in Germany—despite the decline in the working-age population. The reason: labor market participation has increased, for women in particular and older people in general. Also noticeable was a rise in qualification level because well-educated people have a particularly high propensity to participate in the labor market. Most recently, Germany's potential labor force has grown as a consequence of many factors, including migration—from other EU member states in particular. The immigrants from EU countries now exhibits higher labor market participation than that of Germans. This is due to the favorable age structure of the migrants from the EU. The situation is different overall for migrants from non-member states: their participation is relatively low. This may have to do with lack of access to the job market. However, another factor is that the participation of women from non-member states is far below the average. In the future, Germany will be more or less reliant on migration. This is the finding of various model calculations showing the effects of demographic influences and participation behavior on Germany's future labor supply. Even if Germany's level of labor market participation rises to Switzerland's current level by 2040, the finding still applies. The Swiss example shows that policy makers were successful at attracting persons with higher labor market participation from abroad. In Switzerland, the labor market participation of older people is also much higher than in Germany. Policy makers in Germany should take that into account and ensure that skill potential is not prematurely lost to early retirement. Granting tax and social contribution privileges to the semiretired is counterproductive.

Since the turn of the millennium, Germany's demographic change has been a much-discussed phenomenon. Life expectancy is increasing and the younger cohorts are getting smaller because the birth rate is too low, a combination that is forcing the age structure to shift upward. This trend raises the question of whether or not a sufficiently economically active population will be available to the German job market in the long term.

The present report analyzes the most recent development in the work force available to the market—the potential labor force—and in the process, explores the factors that influence the development. The economically active population includes people who are in employment (the employed) and those who are searching for a job, the unemployed.[1] Building upon the analysis, we will present scenarios of future development involving the most influential factors.

As with other comparable analyses,[2] this study can only be based on official statistics. However, the fact that the official statistics exhibit significant deficiencies at present is an aggravating factor. The main problem is that the 2011 census showed that the number of German residents was previously overestimated, and the population data before 2011 has still not been adjusted accordingly. This is why the available data on labor market participation before and after the 2011 census are not compatible.

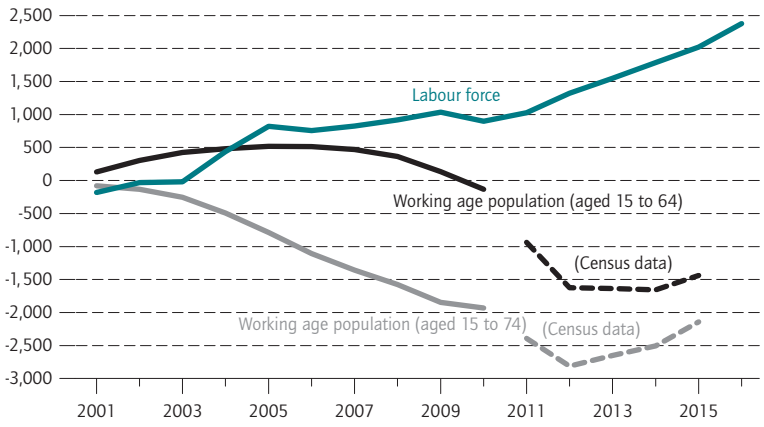
1 The unemployed are those persons who have no paid job, are available to the job market on short notice, and are actively seeking employment.

2 Johann Fuchs, Doris Söhnlein, and Brigitte Weber, "Rückgang und Alterung sind nicht mehr aufzuhalten. Projektion des Arbeitskräftepotenzials bis 2050," *IAB Kurzbericht* no. 16/2011 (2011). (available online, Accessed August 10, 2017); Robert Helmrich et al., "Engpässe auf dem Arbeitsmarkt: Geändertes Bildungs- und Erwerbsverhalten mildert Fachkräftemangel," *BIBB Report* no. 18/2012 (2012). (available online, Accessed August 10, 2017)

Figure 1

Working age population and labor force

Absolute change compared to year 2000, in thousand persons



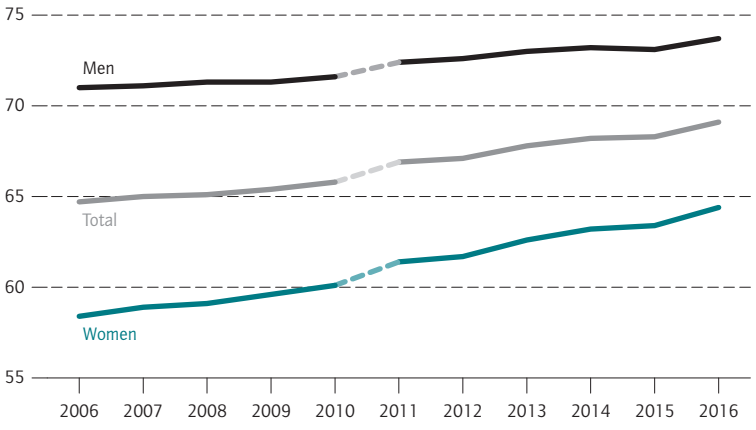
Sources: Federal Statistical Office (population update and national accounts); authors' own calculations.

Labor force grows despite declining working-age population.

Figure 2

Participation rates by gender

Labor force as a percentage of the working age population (15 to 74)



Source: Eurostat (Labor Force Survey).

Labor force participation of women is rising much faster than that of men.

Labor force grows despite declining number of population

In Germany, the population between ages 15 and 64 (the long-standing legal retirement age[3]) is typically considered "able to work". The International Labor Organization (ILO) uses a wider range of working-age people: age 15 to 74. According to the official projection, the size of the population between 15 and 64 has steadily declined in the past decade. It fell by 1.9 million between 2000 and 2010 (see Figure 1). As a result of the census results the number was corrected downward, and it also decreased the following year. As of 2013, the size of the population between 15 and 64 increased—due to migration. The working-age population based on the ILO definition experienced a similar trend except for one deviation. It increased until 2004 but declined thereafter and in 2010 was below the level it had in 2000. Regardless of the range selected and despite any statistical uncertainty, the size of Germany's working-age population clearly decreased between 2000 and 2012. There was a subsequent rise, but it was by no means able to compensate for the previous loss.

The population decline in itself should have resulted in a shrinking potential labor force. But the opposite held true. The national accounts indicated steady growth in the number of employed persons that was only briefly interrupted in 2006 and 2010. At times population growth and labor force growth drifted apart, and the two trends have only developed in parallel recently—both are experiencing an upswing.

We can deduce that the size of the available labor force does not depend on population growth only. Participation behavior is another influencing factor. After all, an increasing proportion of the working-age population is participating in the labor market. The participation rate—the number of economically active persons per 100 residents—has steadily increased. Among 15- to 74-year-olds, it rose from 66.9 percent in 2011 to 69.1 percent in 2016 (see Figure 2). For women in particular, the growth rate surged. Their participation rate is still lower than that of men, but despite starting at a lower level they have significantly reduced the gap.

Labor market participation increasing in other countries

Increasing labor market participation is not solely a German phenomenon; it is in fact prevalent in most Euro-

3 However, at the beginning of 2008 a pension reform went into effect that gradually raises the legal retirement age as of the 1947 birth cohort. Currently, the legal retirement age is 65.5 for the 1952 birth cohort.

Table 1

Participation rates in Europe
Labor force as a percentage of the working age population (15 to 74)

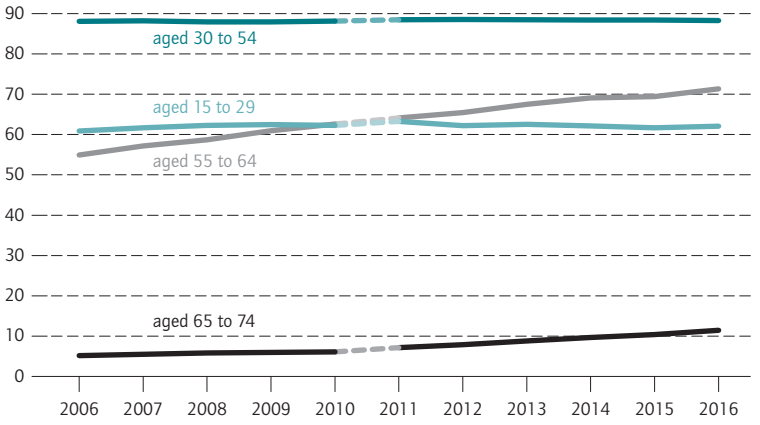
	Total		Men		Women	
	2006	2016	2006	2016	2006	2016
Iceland	82.5	83.8	86.9	87.7	77.8	79.7
Switzerland	73.9	75.6	81.0	80.6	66.9	70.6
Sweden	70.9	72.1	73.8	74.4	67.9	69.7
Estonia	66.1	70.7	71.1	75.8	61.5	66.1
Norway	71.9	70.5	75.4	73.3	68.3	67.6
Denmark	72.4	70.1	76.5	73.5	68.4	66.6
Netherlands	70.2	70.0	76.9	74.9	63.5	65.1
United Kingdom	68.6	69.2	75.1	74.4	62.2	64.1
Germany	**64.7**	**69.1**	**71.0**	**73.7**	**58.4**	**64.4**
Latvia	64.2	68.2	70.8	72.2	58.4	64.6
Austria	64.6	67.7	71.1	72.4	58.3	63.0
Lithuania	60.0	67.6	64.6	70.9	56.0	64.6
Cyprus	67.3	66.3	77.1	71.5	58.1	61.6
Finland	67.2	65.6	69.8	68.1	64.6	63.1
Portugal	67.3	65.5	73.5	69.9	61.4	61.6
Spain	63.6	65.4	73.5	70.5	53.6	60.3
Czech Republic	63.7	65.3	72.2	73.1	55.5	57.6
Ireland	67.0	64.6	76.7	71.5	57.2	57.8
EU	**62.5**	**64.4**	**69.9**	**70.2**	**55.2**	**58.7**
Slovakia	62.8	64.4	71.1	71.4	54.9	57.6
Luxembourg	59.1	63.7	65.6	68.5	52.4	58.8
Slovenia	63.8	62.8	68.8	66.2	58.7	59.3
France	62.1	62.3	67.4	66.3	57.0	58.6
Poland	57.7	61.3	65.0	69.0	50.8	54.0
Hungary	55.0	61.1	62.5	68.6	48.2	54.1
Greece	58.6	59.6	69.9	67.2	47.6	52.3
Malta	52.2	59.6	71.7	71.6	32.7	47.2
Belgium	58.9	59.4	65.7	64.1	52.1	54.7
Romania	58.9	59.3	66.1	68.5	52.0	50.2
Bulgaria	56.2	59.2	61.1	64.3	51.6	54.2
Macedonia	56.7	58.3	68.9	71.1	44.4	45.3
Croatia	53.9	57.4	60.2	62.6	48.0	52.3
Italy	54.8	56.6	66.1	66.0	43.7	47.5
Turkey	46.8	54.2	70.5	74.4	23.9	34.1

Source: Eurostat (Labor Force Survey).

pean countries. Again, starting at a low level, the labor force participation rate of women is rising much faster in Europe than that of men (see Table 1). But Germany is experiencing an above-average increase in participation: it is among the top countries in Europe. The figure is only higher in some northern European countries, Switzerland, and the Netherlands.

Figure 3

Participation rates by age groups
Labor force as percentage of the working age population (15 to 74) in a specific age group



Sources: Eurostat (Labor Force Survey); authors' own calculations.

Especially older people increase their labor market activity.

Women and older people are flocking to the job market

The extent of labor market participation varies considerably with regard to age. The participation rate is particularly high among people age 30 to 54. It is much lower for older people, teens, and young adults. For persons under 29, growth in participation has been slightly negative since 2011 (see Figure 3). In all likelihood, this reflects the fact that a growing portion of this age group is enrolling in institutions of higher education.[4] However, the participation rate of women in that age group has fallen to a lesser extent than that of men (Table 2). From the mid-20s through age 40 to 44, the participation rate among women plateaued, but that of men declined in the same period. Between ages 45 and 49, the labor market participation of men fell while that of women rose. And the participation rate of 55- to 64-year-olds has sharply risen. In the 65+ age group, the participation rate has surged—despite starting at a low level. The rise among women in that age group was considerably sharper than that of men.

4 For example, the proportion of first-year students in an age cohort in 2014 (freshman rate) was just below 60 percent in 2014 – 21 percentage points higher than ten years before. See German Federal Statistical Office, "Hochschulen auf einen Blick," (PDF, German Federal Statistical Office, Wiesbaden, 2016). (available online, Accessed August 10, 2017)

Table 2

Participation rates by gender, nationality, and age groups

Labor force as a percentage of the working age population (15 to 74) in a specific age group

	Total		Natives		Foreigners from EU		Foreigners (except EU)	
	2011	2016	2011	2016	2011	2016	2011	2016
				Total				
15–19	30.4	29.0	30.9	29.5	27.7	31.1	24.0	20.9
20–24	70.9	68.1	71.5	70.2	69.0	71.7	61.7	47.1
25–29	83.2	82.5	85.0	85.5	81.1	84.0	62.7	56.9
30–34	87.0	86.2	89.1	89.4	84.8	84.5	68.3	61.5
35–39	88.0	87.4	89.9	90.3	85.7	85.5	72.6	65.8
40–44	90.3	89.3	91.3	91.6	87.2	88.5	76.0	71.3
45–49	89.6	90.3	90.5	91.7	87.9	88.6	74.5	71.4
50–54	86.6	87.8	87.3	89.0	83.2	85.7	69.9	66.6
55–59	79.0	82.3	79.8	83.3	77.5	80.4	56.3	58.0
60–64	47.4	58.6	48.2	59.1	45.0	61.6	31.1	42.0
65–69	10.2	15.6	10.2	15.7	12.6	17.8	5.7	9.9
70–74	4.6	6.6	4.6	6.6	6.4	10.0	3.4	3.9
75 and older	1.4	1.9	1.4	1.9	.	.	.	.
15–64	77.3	77.9	78.2	79.4	76.6	80.1	62.8	58.5
15–74	75.6	76.5	76.3	77.7	75.7	78.7	63.7	59.2
20–69	66.9	69.1	67.2	69.8	71.1	74.5	58.9	55.1
*Labor force in 1,000**	*41,088*	*42,881*	*37,607*	*38,052*	*1,601*	*2,523*	*1,881*	*2,307*
				Men				
15–19	32.7	31.1	33.3	32.0	29.3	31.8	25.3	20.7
20–24	73.6	69.6	73.7	71.5	74.6	78.5	71.0	49.6
25–29	87.2	85.6	87.5	87.6	91.2	92.9	80.0	66.0
30–34	94.4	92.7	94.8	94.6	95.8	95.1	90.3	75.5
35–39	95.5	94.0	95.9	95.4	96.1	96.2	91.9	81.0
40–44	95.5	93.7	95.9	94.9	95.1	94.2	90.1	83.5
45–49	94.3	93.8	94.6	94.5	95.6	93.7	88.2	82.9
50–54	91.5	91.9	91.8	92.6	91.8	91.8	83.7	78.8
55–59	85.6	87.4	85.9	88.0	86.7	87.6	73.2	71.0
60–64	56.2	64.6	57.1	64.7	50.6	69.1	39.6	52.7
65–69	13.0	19.5	13.2	19.6	12.8	21.1	7.2	14.4
70–74	6.5	9.3	6.5	9.4	7.0	12.1	4.3	4.4
75 and older	2.3	3.1	2.2	3.1	.	.	.	.
15–64	82.7	82.2	82.9	83.0	84.3	87.6	77.3	68.1
15–74	81.3	81.3	81.4	81.8	83.0	86.2	78.7	70.1
20–69	72.4	73.7	72.3	73.9	77.1	81.4	72.0	64.5
*Labor force in 1,000**	*22,074*	*22,984*	*20,066*	*20,086*	*889*	*1,496*	*1,119*	*1,402*
				Women				
15–19	28.0	26.6	28.5	26.9	25.8	30.3	22.6	21.3
20–24	68.2	66.5	69.3	68.9	63.3	64.1	52.8	43.7
25–29	79.2	79.1	82.5	83.3	71.5	73.8	47.8	45.1
30–34	79.5	79.4	83.4	84.0	74.7	72.2	48.1	47.3
35–39	80.6	80.6	83.9	85.1	76.7	73.1	55.2	51.5
40–44	84.9	84.8	86.6	88.2	79.2	81.6	61.6	58.9
45–49	84.9	86.7	86.3	88.9	78.9	82.3	60.1	59.4
50–54	81.8	83.7	83.0	85.4	74.6	78.1	57.7	53.5
55–59	72.6	77.3	73.9	78.7	68.1	71.6	44.1	45.3
60–64	38.9	52.9	39.6	53.7	38.1	52.5	23.4	33.7
65–69	7.5	12.0	7.5	12.2	12.3	13.9	3.9	6.2
70–74	3.1	4.3	3.1	4.3	5.2	7.6	1.9	2.7
75 and older	0.8	1.0	0.8	1.0	.	.	.	.
15–64	71.9	73.6	73.5	75.8	68.8	71.3	49.2	48.0
15–74	69.9	71.7	71.2	73.7	68.2	69.9	49.7	47.8
20–69	61.4	64.4	62.2	65.8	64.7	66.3	46.5	44.9
*Labor force in 1,000**	*19,014*	*19,898*	*17,541*	*17,966*	*712*	*1,027*	*761*	*905*

* *15–74 years*

Source: Eurostat (Labour Force Survey); Calculations of DIW Berlin.

Persons 75+ are the exception. Among them men's participation in the labor market increased more decisively. Indeed, the people in this age group are not considered part of the working-age population according to any statistical convention. However, the number of economically active persons among them rose from 100,000 in 2011 to 160,000 in 2016.

EU citizens have higher labor market participation than Germans– non-EU citizens lag far behind

There are also differences in the labor market participation between German citizens and foreigners. And the foreign population must be divided into EU citizens and those with a nationality of other countries.

Among the EU population in Germany, overall participation was at higher than it was among Germans in 2016. Five years ago, that was not the case. The recent surge in migration in the EU has attracted more labor to Germany, and the participation rate among young migrants from the EU was higher than it is in Germany. This is a long-term trend.[5] With respect to age-specific participation, the trend was similar to that of the Germans: among middle-aged persons the already high participation rate plateaued from 2011 to 2016, and among older ones it rose. However, it is apparent that among EU citizens the differences between genders with regard to participation are greater than among Germans—precisely this has diverged in recent years. All in all, the key factor was the age structure of the migrants from the EU, which was favorable for the job market. If they had had the same age structure as Germans, their participation rate would have been much lower—by almost seven percent.

Among non-EU citizens living in Germany, the participation rate was far below the average across all age groups. And it has dropped sharply—except among older people. This could be due to the recent influx of asylum seekers, who as a rule receive a work permit only after having been granted a residence permit. However, as apparent in the immense difference in the participation rates of men and women, this is not the only reason. Traditional gender roles that exclude women from the job market are likely to exist among non-EU citizens from non-industrialized countries.

Different effects of labor market participation and population growth on the potential labor force

The question arises as to what extent changes in participation behavior and the demographic change have contributed to potential labor force growth in recent years. The answer can be found in model calculations. Assuming that participation behavior in 2016 was the same as it was in 2011 and that the population structure with regard to age and gender did not change either—but the number of residents did—the effect of the change in number of population alone is highlighted. Holding only the participation rate constant highlights the effect that emerges due to changes in the composition of the working-age population. And adding the participation rate to the calculation yields information on the behavioral effect.

The key factor for potential labor force growth is increasing labor market participation. In the period from 2011 to 2016, it was just under one million persons (see Table 3), most of whom were women. By around 400,000 persons respectively, the pool grew due to population growth on the one hand and on the other, due to a change in the composition of the population that caused a shift toward the age cohorts with a relatively high participation.

However, the development looked very different depending on nationality. Among Germans, the number of working-age residents declined sharply, but this was compensated for primarily by increased labor market participation and a change in population composition. For women in particular it was significantly overcompensated. Among the EU citizens in Germany all of the variables had an influence on the growth of the potential labor force, but the most significant factor was population growth caused by migration. For persons from non-EU countries, the potential labor force also expanded primarily as a result of population growth. However, in this case the impact of the effect was dampened by reduced participation in the labor market.

Well-qualified persons most frequently active in the job market

Participation behavior is closely related to professional education and training: the better the qualification, the higher the participation rate (see Figure 4). Qualifications may also be representative of other conditions. Usually people who are well educated have more interesting jobs and thus a higher intrinsic motivation to work. People with low qualifications often have physically taxing jobs and are frequently forced into early

5 Karl Brenke and Nina Neubecker, "Struktur der Zuwanderungen verändert sich deutlich," *DIW Wochenbericht* no. 49 (2013): 3–21. (available online, Accessed August 10, 2017).

Table 3

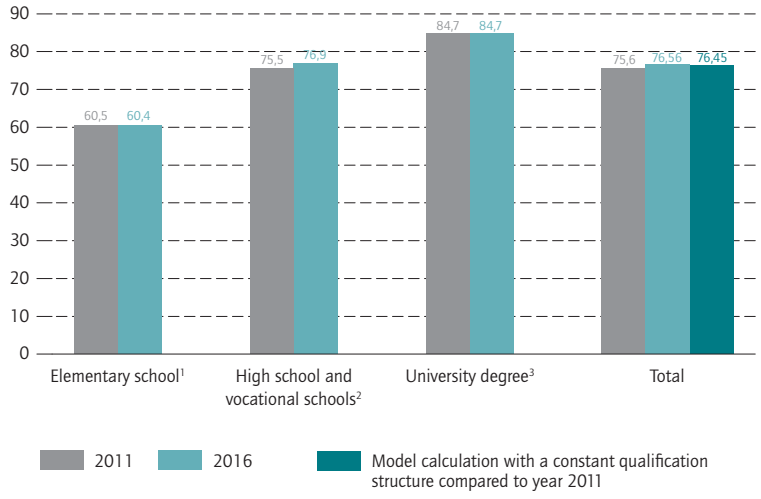
Components of the labor force change between 2011 and 2016 by gender and age
Absolute change compared to 2011, in thousand persons

	Demographic effect		Behavioral effect = change of the participation rate compared to 2011	Total effect
	due to the change of the working age population (15 to 74) with a constant age and gender structure	due to the change in the age and gender structure of the 15 to 74 years old		
Natives				
Men	−534	216	339	20
Women	−467	77	815	425
Total	−1,001	293	1,154	445
Foreigners – EU				
Men	446	123	38	607
Women	357	−75	32	315
Total	804	48	70	922
Foreigners – Non-EU				
Men	350	123	−190	282
Women	238	−57	−37	144
Total	587	65	−226	426
All nationalities				
Men	261	461	187	910
Women	128	−55	810	883
Total	390	406	998	1,793

Source: Eurostat (Labor Force Survey); authors' own calculations.

Figure 4

Participation rates by education
Labor force as a percentage of the population aged 20 to 69



1 ISCED 0 to 2.
2 Including High-school degree, ISCED 3 to 4.
3 ISCED 5 and higher.

Source: Eurostat (Labor Force Survey); authors' own calculations.

The better the education the higher labor market participation

retirement by physical wear and tear or stress due to monotonous tasks.

The overall level of qualification has continued to rise in recent years. The proportion of highly qualified people with an academic degree or master's certificate in the working-age population has increased[6]—to the detriment of people without professional education or training and those who have completed an apprenticeship or possess a vocational school degree (see Figure 5). Their proportion rose among women, and at the same time the proportion of women with low skills fell sharply. Among men, however, there is a disparity: both people with academic degrees and those with low skills have gained in importance, the latter due to migration.[7] The general rise in qualification level from 2011 to 2016 also had an impact on the participation rate. As the results of a fur-

6 Complete information is only available for persons between ages 20 and 69 in the source we used: the Eurostat "Labour Force Survey" database. (available online, Accessed August 10, 2017)

7 According to the results of the microcensus, the number of male non-EU citizens with personal migration experience (not including persons in training and children), who have not completed a professional education or training program, grew by a solid half a million between 2011 and 2016. See German Federal Statistical Office, "Bevölkerung mit Migrationshintergrund – Ergebnisse des Mikrozensus 2016," *Bevölkerung und Erwerbstätigkeit* series 1 vol. 2.2 (2016). (available online, Accessed August 10, 2017)

ther model calculation showed,[8] the participation rate would have been 0.012 percent (equal to 60,000 persons) lower without the rise.

Scenarios indicate future labor supply trend

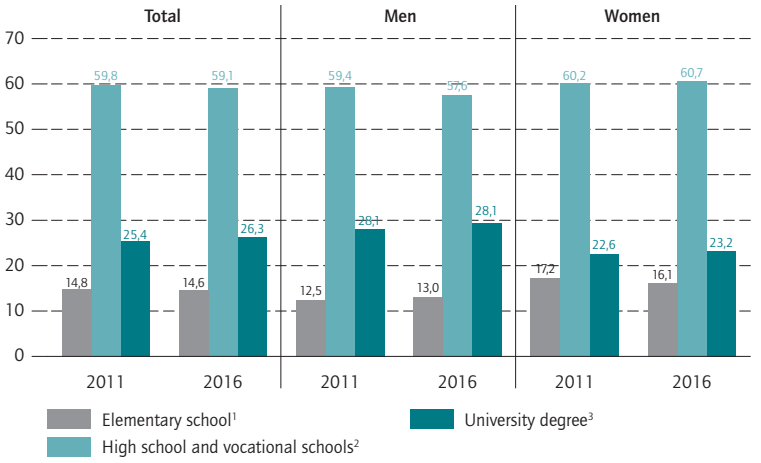
Until now, Germany has been able to manage the demographic shift primarily due to a rise in labor market participation. However, the challenges will increase as more and more large birth cohorts—the baby boom generation—reach retirement age. The baby boom reached its peak in 1964. After the birth control pill hit the market, the number of births declined sharply until the beginning of the 1970s (see Figure 6).

To outline the consequences of this wave based on natural population movement, we calculated scenarios with a time horizon of 2040. Our intention was not to make a forecast. Instead, we wanted to outline the effects of specific influences. Our scenarios are based on the data of the 13th official coordinated population projections. For each of the scenarios, we calculated two variants: with and without a positive net migration.[9] We assumed an annual net migration of 200,000 persons across all age groups. That might seem conservative in light of the recent trend, but the official population projections did not contain higher surpluses. We ran five scenarios:

1) In the reference scenario (EU-PR), the future participation rate calculation was based on a time series model corresponding to the EU Commission's methodology for determining growth potential.[10] With this approach, however, we assumed uniform participation behavior for the total working-age population. This ignores the fact that it varies significantly depending on age and gender. And we were unable to take changes in the age structure into account. According to this scenario, the potential labor force with zero net migration will expand slightly until 2020 but will shrink by 3.5 million people by 2040 (see Figure 7). With an annual net migration of 200,000 persons, the potential labor force will expand until 2025 but by 2035, will be lower than it was in 2016 (see Figure 8).

Figure 5

Population aged 20 to 69 by education
Share in percent



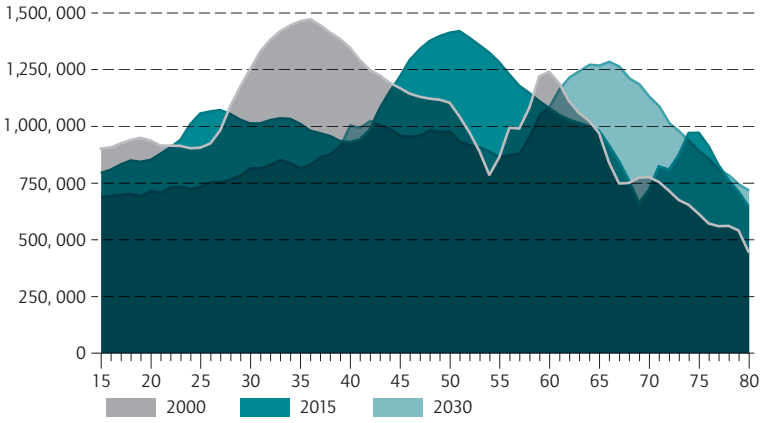
1 ISCED 0 to 2.
2 Including High-school degree, ISCED 3 to 4.
3 ISCED 5 and higher.

Source: Eurostat (Labor Force Survey); authors' own calculations.

The share of highly-educated working-age population increases.

Figure 6

Population by single ages 2000, 2015, and 2030
Persons



Source: Federal Statistical Office (population update and national accounts).

More and more baby boomer reach their retirement age.

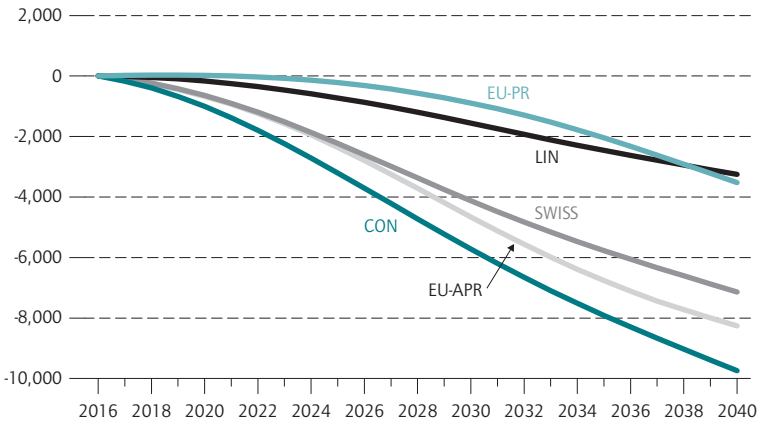
8 We assumed that the qualification structure in 2016 was the same as it was in 2011 and that otherwise the population structure and employment behavior trends behaved as they actually did.

9 We used the purely hypothetical variant (G1-L1-W0) with net migration to Germany of zero and the variant with net migration to Germany of 200,000 persons (G1-L1-W2).

10 See Karel Havik et al., "The Production Function Methodology for Calculating Potential Growth Rates & Output Gaps," *European Commission Economic Papers* 525 (2014). (available online, Accessed August 10, 2017)

Figure 7

Change of the potential labor force under different scenarios between 2016 and 2040 without net migration
Thousand persons

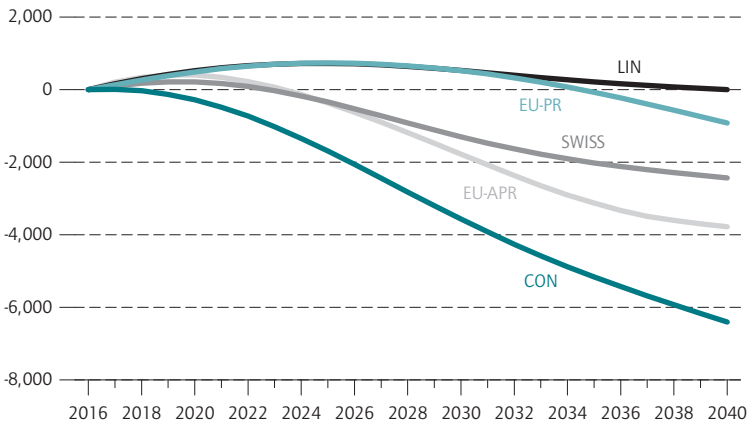


Source: Eurostat (Labor Force Survey); Federal Statistical Office; authors' own calculations.

With zero net migration the potential labor force willl shrink.

Figure 8

Change of the potential labor force under different scenarios between 2016 and 2040 with positive net migration
Thousand persons



Source: Eurostat (Labor Force Survey); Federal Statistical Office; authors' own calculations.

With positive net migration the loss would be much lower.

2) The second scenario (CON) assumes that employment behavior does not change after 2016 and therefore, only demographic influences will have an effect. Without migration, the potential labor force would lose a good 9.5 million persons by 2040. The loss would be compounded by the fact that the proportion of people in age cohorts with relatively low labor market participation (60- to 74-year-olds) will rise; while the proportion of middle-aged cohorts with higher participation will fall (see Table 4). Even if there is an annual gain in migration of 200,000 persons, the potential labor force would contain at least six million persons less in 2040 than it did in 2016. However, such a scenario is less likely, as there is no evidence that the current trend of changing participation will immediately and abruptly stop.

3) In a further scenario (LIN), alongside the demographic effects we assumed continued changes in labor market participation. The calculation was based on the presumption that the participation rate in the individual age groups and for both sexes would develop as it has on average for the past five years.[11] Without a migration surplus, the potential labor force would shrink by at least three million persons by the end of the projected horizon. Adding the above-mentioned migration surplus would reverse the decline in the number of employed people forecast for 2040. However, it is also unrealistic to assume a constant linear increase in the participation rate over the next 23 years because some age groups would exhibit implausibly high labor market participation as a result. For example, 55- to 64-year-olds would have a participation rate of 98 percent.

4) The time series method of the reference scenario can also be applied to individual age groups and calculated with age- and gender-specific participation rates, yielding different results.[12] In this scenario without a migration surplus (EU-APR), the potential labor force would shrink as early as the following year and encompass eight million fewer people by 2040. Adding back the migration surplus cuts the magnitude of the decline in half. However a major problem with these types of models is their systematic orientation to purely statistical efficiency crite-

11 This results in a curve similar to that of the reference scenario, since a linear projection of the aggregated participation rate implicitly assumes that the cohort-specific participation rate also follows a linear trend. The difference is a result of the age-specific participation rates that achieve values over 100 percent due to the linear projection being restricted to the average value of the past three years, rendering them non-linear.

12 With this approach, age-specific participation rates are estimated and extrapolated using ARIMA models. The selection of the optimal model for the respective age cohort is based on the usual information criteria.

ria, which makes interpreting the results contextually very difficult.[13]

5) In the last scenario (*SWISS*), we assumed that the age-specific participation rates of men and women would converge to today's participation rates in Switzerland by 2040. Switzerland is the optimal reference country because its economy is similar Germany's.[14] Unlike the other scenarios, this model also takes the differences in the participation behavior of German citizens and non-German citizens into consideration. Without net migration, the potential labor force would lose a good seven million persons by 2040. If there is a surplus of the magnitude included in the other scenarios, there would be a loss of 2.4 million employed persons, and the number would be lower than that of 2016 from 2023 onward. Unlike the model-driven projection, country-specific factors have an impact in the *SWISS* scenario. In Switzerland, the participation rate is higher than it is in Germany in general. And especially worthy of note is that the Swiss figures far surpass Germany's for people with German citizenship among men and women age 15 to 19, women age 20 to 34, and both women and men age 65 to 74 (see Table 5). The non-German population shows even greater differences—for women in particular and above all, for persons under 40. The differences between Germany and Switzerland are in part based on the differences in participation behavior of the non-German population in the two countries—and therefore on the differences in the social composition of the non-German population.

All of our scenarios yielded potential labor force shrinkage by 2040—only the extent and timing of the decrease varied. If we assume that positive net migration will be significantly lower than they have been recently, a decrease in the economically active population is also unavoidable. However, the loss would be much lower than it would be in the case of a zero net migration.

Table 4

Components of the change in the native potential labor force between 2016 and 2040

Absolute change compared to 2016, thousand persons

	Demographic effect (CON)	Behavioral effect			Total effect		
		LIN[1]	EU-APR[2]	SWISS[3]	LIN[1]	EU-APR[2]	SWISS[3]
15–19	24	−334	−303	630	−310	−279	654
20–24	−571	−155	−5	270	−726	−576	−301
25–29	−1,047	52	−211	183	−996	−1,259	−864
30–34	−1,155	21	103	111	−1,134	−1,051	−1,044
35–39	−920	44	112	50	-876	−808	−870
40–44	−1,049	38	569	12	−1,011	−481	−1,037
45–49	−1,452	192	−347	27	−1,260	−1,799	−1,424
50–54	−1,617	273	−159	89	−1,344	−1,776	−1,528
55–59	−1,341	592	288	122	−749	−1,053	−1,219
60–64	−650	1,385	599	154	735	−51	−496
65–69	89	3,126	445	377	3,215	534	466
70–74	135	1,070	207	392	1,205	342	527
15–74	−9,554	6,304	1,296	2,419	−3,251	−8,258	−7,136

	Demographic effect (CON)	Behavioral effect			Total effect		
		LIN[1]	EU-APR[2]	SWISS[3]	LIN[1]	EU-APR[2]	SWISS[3]
15–19	24	−260	−315	921	−236	−291	945
20–24	−451	−332	5	441	−783	−446	−10
25–29	−918	−28	−119	385	−946	−1,037	−533
30–34	−951	−134	288	314	−1,085	−664	−637
35–39	−564	−165	116	235	−729	−448	−329
40–44	−440	−81	698	144	−520	259	−296
45–49	−787	166	−196	138	−620	−983	−649
50–54	−1,096	180	−40	183	−916	−1,136	−913
55–59	−972	631	294	199	−341	−678	−773
60–64	−433	1,716	1,210	135	1,283	776	−299
65–69	135	3,426	399	380	3,561	534	515
70–74	150	1,179	184	397	1,328	334	547
15–74	−6,304	6,299	2,524	3,872	−5	−3,780	−2,433
Migration effect	**3,250**	**745**	**1,228**	**1,453**	**3,995**	**4,478**	**4,703**

1 In scenario LIN the age-specific participation rates are projected by using 5-years averages of the growth rate
2 In scenario EU-APR age-specific participation rate are projected by using ARIMA-models
3 in scenario SWISS the age-specific participation rates of men and women converge to the respective Swiss participation rate until 2040

Source: Eurostat (Labor Force Survey); authors' own calculations.

Conclusion

As running several model variants has shown, further increases in the participation rate will not do the job of compensating for diminishing potential labor force in the future. At the same time, the available working force should be encouraged to remain in the job market for as long as possible. Political intervention, such as the "Retirement at 63" plan, are just as counterproductive as the existing support for partial retirement with regard

13 This is why structural models for Germany should be verified for further research. See the preparatory work by Bruce C. Fallick and Jonathan F. Pingle, "A Cohort-based Model of Labor Force Participation," *Finance and Economics Discussion Series 2007-09* (2006). (available online, Accessed August 10, 2017) and Almut Balleer Ramón Gómez Salvador, and Jarkko Turunen, "Labour Force Participation across Europe: A Cohort-based Analysis," *Empirical Economics* 46(4) (2014): 1385–1415. (available online, Accessed August 10, 2017)

14 For example, the manufacturing industry was responsible for 19 percent of gross value added in Switzerland in 2015, and in Germany the proportion was 23 percent. The service sector accounted for the remaining gross value added almost entirely as agriculture plays a minimal role in both countries. Further, Switzerland is an immigration country that must deal with the effects of its future demographic shift. And the job market situation in Switzerland has also developed very favorably in recent years.

Table 5

Difference between age-specific Swiss and German participation rates by gender and country of origin
Percentage points

	Participation rate difference of natives in percentage points			Participation rate difference of foreigners in percentage points			Participation rate difference of total population in percentage points		
	Women	Men	Total	Women	Men	Total	Women	Men	Total
15–19	28	27	28	27	29	28	28	27	27
20–24	14	4	9	26	20	22	6	7	7
25–29	8	4	6	25	18	21	15	7	11
30–34	5	3	4	24	12	17	10	7	8
35–39	3	1	2	18	9	14	7	4	5
40–44	−2	3	0	10	8	9	4	3	3
45–49	−1	2	1	10	5	8	−1	3	1
50–54	2	2	2	8	8	9	−1	2	1
55–59	4	3	3	9	8	9	1	3	2
60–64	2	7	4	0	−5	−1	3	3	3
65–69	6	12	9	1	0	1	1	5	3
70–74	5	10	7	3	0	2	6	10	8
15–74	5	5	5	18	12	15	5	9	7

Source: Eurostat (Labor Force Survey); authors' own calculations.

to taxes and social security contributions.[15] These privileges should be abolished.

The model calculations until 2040 presented in this study should only be interpreted as indications of the importance of individual determinants that have an influence on the future potential labor force—not as forecasts of its dimensions. It would be virtually impossible to make a scientifically sound forecast of this type, just as it would be to quantify the anticipated labor requirement. After all, supply and demand are mutually dependent. When labor supply becomes scarcer, its price—that is, wages—rises. Higher earned income could attract labor participation from outside Germany to precisely the market segments most in need of a larger labor force. These would probably involve highly demanding jobs that require a labor force with the relevant qualifications.

On the other hand, rising wages would force companies to increase their productivity in order to use labor more efficiently. In this respect, there is plenty of room to maneuver: in Germany, productivity and investment growth have been in the doldrums in recent years. Whether an increasingly qualified labor force is motivated to migrate to Germany or German companies become more productive and innovative, the result in either case would be positive from an economic viewpoint. The demographic change should be viewed as an opportunity and not a risk. After all, the entire history of mankind shows that necessity is the mother of progress.

15 Although the supplemental contributions paid by employers are exempt from taxes and social security contributions (see § 3 no. 28 Income Tax Act (*Einkommensteuergesetz*, (EStG)), they are subject to a progression proviso. This is essentially a wage component.

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