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Abstract

Many questions have been raised about the political and economic consequences of the recent surge in refugee immigration in Europe. Can refugee immigration promote long-term per-capita growth? How are the drivers of per-capita growth influenced by immigration? What are the policy implications of refugee immigration? Using an adjusted Cobb–Douglas production function, with labour divided into two complementary groups, this study attempts to provide some answers. By applying the model to current immigration data from Germany, the study finds that refugee immigration can lead to long-term per-capita growth in the host country and that the growth is higher if immigrants are relatively young and have sufficiently high qualifications. Further, capital inflows are a prerequisite for boosting per-capita growth. These findings can inform the migration policies of countries that continue to grapple with refugee immigration.

Keywords: *Refugee, Immigration, Growth, Labour Supply, Wages*
JEL codes: *E20, F22, O41*

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Introduction

The issue of refugee immigration has dominated European politics for the past five years. The significant increase in immigration rates since 2015 and the mass migration into southeast Europe, however, has not elicited uniform reactions across the continent. While most of the East European countries have been very restrictive, countries such as Germany and Sweden were initially more open to immigrants. This is because Germany, for example, can be characterised as a relatively tolerant society, and, initially, the majority of its population and the media were in favour of government policies (Haller, 2017). However, the subsequent change in public opinion (GfK Verein, 2018) led to revisions in political actions. Both Germany and Sweden have since adopted much stricter immigration regulations (*Migrationspaket* in Germany and temporary law of temporary residence status in Sweden). Although it seems unlikely that these countries will witness any largescale immigration in the coming years,[1] given the alarming consequences of climate change (Perch-Nielsen et al., 2008) and the large wealth gap between Europe, on the one hand, and North and Central Africa, on the other (Stark, 2017), one can reasonably assume that immigration rates in the future will mostly be higher than previously estimated.[2]

Recognising the need for an in-depth analysis of immigration, many scholars have published studies on the social, political, demographic, economic, and fiscal effects of refugee immigration in recent years. In Sweden, for example, most studies highlight the negative aspects of general and refugee immigration (Lundborg and Segerstrom, 2002; Lundborg, 2013; Ruist, 2015; Aldén and Hammarstedt, 2019), including the ones published before the 2015 event. Similar findings have also been reported by studies that are not based in any individual country (Dustmann et al., 2017; Hansen et al., 2017), too.

In Germany, on the other hand, some studies have focused on the positive economic effects of refugee immigration, especially those published in the first few months of the movement (Fratzscher and Junker, 2015; Bonin, 2016). Later, however, papers on the negative economic effects of refugee immigration (van Suntum and Schultewolter, 2016; Hentze and Kolev, 2016), especially its effects on fiscal sustainability (Bahnsen et al., 2016; Manthei and Raffelhüschen, 2018), became more prominent. This study attempts to offer a diverging viewpoint based on the theoretical assumption that population growth in absolute terms generally induces economic growth.[3] Accordingly, this study examines the economic effects of immigration by focusing specifically on per-capita growth. It is important to add here that countries like Germany have a well-developed and comprehensive social system, in which the productive inhabitants support the less productive ones through tax-financed redistribution. In this

[1] Partly because of the social situation, partly because of the corona pandemic.

[2] From a purely legal point of view, those who migrate for economic reasons are not refugees, but they share similarities with refugees in terms of age and qualification structures. Thus, the assumption that both groups have similar implications seems plausible.

[3] The expected rise in demand alone would lead to growth. In addition, each additional employee increases the country's economic output.

scenario, negative per-capita growth induced by immigration may place an additional burden on local taxpayers regardless of absolute economic growth.

The two main factors affecting the per-capita growth effects of migration are age and qualification structures of the immigrants (Boubtane et al., 2016). Ceteris paribus, per-capita growth can improve if the qualification structure of the immigrants is better than that of the local population. Even a poor qualification structure among immigrants can promote per-capita growth provided a large percentage of them are of working age compared to the native population, which then increases the labour force share of the total population (age structure effect). Another significant factor affecting per-capita growth is capital mobility, particularly the increase of capital inflows from abroad, for example, via foreign direct investments (FDIs). If the increase in labour supply leads to a relative reduction in wages, economic theory suggests that the price of capital will rise and subsequently result in greater foreign investments (Samuelson, 1948) if factor price elasticity is sufficiently high. Ceteris paribus, this could lead to per-capita growth. Apart from the above, other smaller factors (e.g. state consumption and integration) can also affect per-capita growth.

Interestingly, the growth effects of refugee immigration, whether per-capita or absolute, have not been sufficiently researched. While the effects of general migration on growth have been extensively studied, those of refugee migration have not received any scientific attention. In light of future projections about refugee immigration, I argue this topic is highly relevant not only from a scientific point of view but also from a political and social perspective.

Using an adjusted Cobb–Douglas production function with labour divided into two complementary groups, a two-step quantitative analysis of the long-term per-capita growth effects of refugee migration is conducted. The research aims to determine whether the effects are mainly positive or negative, to assess the impact of individual drivers of growth and to derive policy implications. Germany is chosen as the case study site because the country has accepted the highest number of refugees in Western Europe since 2015, and it represents a midpoint within Europe in terms of geography, per-capita growth and the welfare state system.

The results of the analysis indicate that refugee immigration can lead to long-term per-capita growth between +1.33 per cent and +1.96 per cent. However, this growth depends heavily on the elasticity of the relative price of capital to labour and the subsequent capital inflow from abroad. Without any migration-related increase of the private capital stock, the per-capita growth would be negative (–0.62 per cent to –1.15 per cent), even if the immigrants' qualification structure is identical to that of the natives. Thus, the results of this work serve to underscore the significance of the relationship between per-capita growth and refugee immigration.

The remainder of this paper is organised as follows. The Theoretical Model section explains the theoretical model proposed in this paper. The Data and Scenarios section presents a descriptive

analysis, an overview of the hypothesised scenarios, their derivations and a sensitivity analysis. The results and conclusions are presented in the Results section and the Conclusions section respectively.

Theoretical Model

This study uses an augmented Cobb–Douglas production function. According to the Cobb–Douglas production function, the output – GDP in this study – is dependent on the production factors: labour and capital. Labour usually refers to the number of workers in an economy or their working hours. Capital is typically defined as all the assets in a national economy (i.e. cash and financial assets as well as buildings, land and machinery). Government consumption has also been considered in this study to better account for integration costs. Further, a scaling factor is used to scale the model's output to the actual GDP.

Taking the above factors into account, the GDP (Y_t) in every year *t* is given by:

$$Y_t = \beta * c_{S,t} * K_{S,t}^{\propto_1} * K_{P,t}^{\propto_2} * L_{WC,t}^{\propto_3} * L_{BC,t}^{\propto_4} . \quad (1)$$

Here β is the total factor productivity, which serves as the GDP scaling factor. $c_{S,t}$ denotes the impact of state consumption on GDP and includes, for example, budgets for social security systems, education, infrastructure and integration costs. Capital is divided into two categories. The first category, state capital stock ($K_{S,t}$), is mostly subject to the constraints of investment and depreciation (see Equation 4) and is only indirectly influenced by immigration. The second category, private capital stock ($K_{P,t}$), inter alia, depends on the size of the labour force in the national economy (see Equation 7) and is, therefore, directly exposed to the effects of migration.

To capture the growth effects of migration, especially refugee migration, in a meaningful way, the labour factor needs to be differentiated according to productivity. Since productivity is more difficult to quantify in data lacking a migration context, this paper uses qualification levels as they are strongly linked to productivity (Becker, 1962). Accordingly, the labour force is divided into two groups: an above-average productive group (white-collar workers), with excellent qualifications and a less productive group (blue-collar workers), with lower qualifications. To consider the possible migration-related wage effects, this study uses wages instead of the number of workers. Thus, $L_{WC,t}$ is the sum of all the wages of white-collar workers, and $L_{BC,t}$ that of blue-collar workers. Depending on the qualification structure of the immigrants, the ratio of blue to white-collar workers can change and, following the theory of supply and demand, affect relative labour prices (wages).

The coefficients $\propto_1$,$\propto_2$, $\propto_3$ and $\propto_4$ are fixed over time and define the impact of each type of capital and wage factor on the output. The sum of all four coefficients is 1. $\propto_1$ and $\propto_2$ represent the share of GDP that is derived from gross profit. They depict the influence of the two capital stocks (state

and private) on the nominal GDP. $\propto_3$ and $\propto_4$ denote the share of GDP derived from the labour force. These coefficients together capture the impact of the sum of all wages on the GDP.

The following equation accounts for state consumption:

$$c_{S,t} = \left(\frac{C_{S,t}}{C_{S,t-1}}\right) * \frac{C_{S,0}}{Y_0}, \tag{2}$$

where $c_{S,t}$ is the scalar of state consumption, and $\frac{C_{S,0}}{Y_0}$ scales the impact of this scalar to the GDP. The absolute consumption of the state is defined as

$$C_{S,t} = \bar{C}_S + P_t * \bar{c}_S^{flex} + (1 - \sigma) * E_{BI,t}, \tag{3}$$

with $\bar{C}_S$ as a fixed level of state consumption, which does not vary with the size of the population P_t. This is because some expenditures, such as defence, are relatively inelastic for changes in population size. Most other expenditures are calculated with a constant per-capita sum $\bar{c}_S^{flex}$. The rest of the state consumption is driven by integrations costs $E_{BI,t}$. This includes direct integration costs for services such as food, shelter, medical aid and language courses provided to immigrants. It also accounts for spending on unemployment, under-age immigrants, social assistance for the elderly and the costs incurred on deportation/voluntary departures. In this paper, integration costs are treated as state consumption, and the model assumes that the state finances these integration costs by cutting down its consumption or by cutting down its investments.[4] However, the inclusion of integration costs under state consumption does not negatively affect the latter, as the category of expenditures is irrelevant to GDP. On the other hand, cuts in investments to pay for integration costs $[(1 - \sigma) * E_{BI,t}]$ do increase consumption. The factor σ, which takes a value between 0 and 1, denotes how much of the integration costs are covered by cuts in state consumption.

The state capital stock is estimated as follows:

$$K_{S,t} = \left(K_{S,t-1} - K_{S,t-1} * \bar{q}_A + I_{S,t-1}\right) * lk_t. \tag{4}$$

Each year, the capital stock depends on that of the previous year ($K_{S,t-1}$) and on the development of the relative price of labour to capital (lk_t; see Equation 6). Further, it decreases by the fixed depreciation rate $\overline{q_A}$ and increases with the state's investment ($I_{S,t-1}$), which is calculated by

$$I_{S,t} = K_{S,t} * \bar{q}_I - (1 - \sigma) * E_{BI,t}. \tag{5}$$

It is assumed that each year, a fixed quota ($\bar{q}_I$) is invested by the state. $\bar{q}_I$ and $\overline{q_A}$ are ideally fixed with the same value, so that the state capital stock decreases over time if investment cuts are used to finance integration costs ($\sigma < 1$). In the short term, Y_t increases for all $\sigma < 1$ as short-term consumption offsets long-term investment in the state capital stock because of $\propto_1 < 1$. Subsequently, a

[4] Borrowing, another possible alternative to finance these costs, is excluded from the model. For host countries that follow a strict policy of balanced budgets like Germany, this modelling seems realistic.

negative relationship develops between immigration and the state capital stock because immigrants benefit from public capital spending without having contributed to the public budget through, for example, tax or social contribution payments (Piras, 2011). With immigrants unable to bring in their capital, especially refugees,[5] immigration, or more precisely integration and its associated costs, will lead to a long-term decrease in state capital and present a hindrance to growth.

The development of the relative price of labour to capital is given by:

$$lk_t = \frac{\left(\frac{LF_{t-1}}{K_{S,t-1}+K_{P,t-1}}\right)^{\propto_3+\propto_4}}{\left(\frac{LF_0}{K_{S,0}+K_{P,0}}\right)^{\propto_3+\propto_4}}. \quad (6)$$

lk_t accounts for relative price changes of capital to labour to meet the principle of supply and demand. For example, an increase in the size of the labour force (LF_t), ceteris paribus, leads to a decrease in wages and an increase in the price of capital.

Analogically, the development of the relative price of capital to labour (kl_t) is given by:

$$kl_t = \frac{\left(\frac{K_{S,t-1}+K_{P,t-1}}{LF_{t-1}}\right)^{\propto_1+\propto_2}}{\left(\frac{K_{S,0}+K_{P,0}}{LF_0}\right)^{\propto_1+\propto_2}}. \quad (7)$$

Private capital is strongly affected by the size of the labour force and by the development of the relative price of labour to capital:

$$K_{P,t} = \left(\overline{K_{FP}} + LF_t * \overline{k_{LF}}\right) * lk_t. \quad (8)$$

While $\overline{K_{FP}}$ is a fixed share of the private capital stock that is independent of labour force changes, $\overline{k_{LF}}$ is a fixed amount of per-capita capital that each member of the labour force holds or attracts. Private capital has been computed in this way because domestic firms may borrow money to satisfy higher demand for goods, but with a higher supply of labour, and the consequent increase in the factor price for capital, borrowing money in the host country will become more expensive than borrowing from abroad. This could stimulate capital inflows from abroad. In addition, the host country is favourably placed to attract long-term FDIs from the rest of the world. As the economic theory of factor price equalisation (Samuelson, 1948) states, an open economy with a relatively high factor price tends to encourage an inflow of the respective factor.[6]

The sum of all white-collar workers' wages is calculated by

$$L_{WC,t} = LF_{WC,t} * w_{WC,t}. \quad (9)$$

[5] This is because, on average, refugees pay 7100 euros per person to flee to Germany (Federal Office for Migration and Refugees, 2016), which may possibly constitute their entire mobile capital.

[6] Other studies have analysed economic migration instead of refugee migration (Kugler and Rapoport, 2007; Javorcik et al., 2011). Hence, they do to not account for a war in the country of origin, which could detrimentally affect foreign investments.

$w_{WC,t}$ is the average yearly wage of a white-collar worker and $LF_{WC,t}$ the sum of white-collar workers. This yearly wage depends on the yearly wage in the base year ($w_{WC,0}$), the development of the ratio of blue to white-collar workers and the relative price of labour in the host country:

$$w_{WC,t} = w_{WC,0} * \frac{\left(\frac{BC_t}{WC_t}\right)^{\propto_4}}{\left(\frac{BC_0}{WC_0}\right)^{\propto_4}} * kl_t. \quad (10)$$

The first quotient captures the development of the ratio of blue to white-collar workers. In each year, the ratio of blue to white-collar workers is calculated in relation to their ratio in the base year. Such modelling implies that any change in the ratio has a direct impact on the wages of the workers. For example, if the proportion of blue-collar workers among immigrants is higher than that in the host country, immigration can lead to a relative increase in the wages of white-collar workers. If the ratio of total capital stock to total workforce increases, relative to the base year, the price of labour increases and thus the wages.

Analogous to the wage bill of white-collar workers, the sum of wages of all blue-collar workers is calculated as follows:

$$L_{BC,t}=LF_{BC,t}*w_{BC,t}. \quad (11)$$

The sum of all blue-collar workers is $LF_{BC,t}$ and the average wage of a blue-collar worker is $w_{BC,t}$. Here, analogous to Equation 10, the development of the ratio of white to blue-collar workers is taken into account:

$$w_{BC,t}=w_{BC,0}*\frac{\left(\frac{WC_t}{BC_t}\right)^{\propto_3}}{\left(\frac{WC_0}{BC_0}\right)^{\propto_3}}*kl_t. \quad (12)$$

The number of blue- and white-collar workers in each period, as well as of P_t, depend on three factors: demographics, migration and integration. I employ a population projection model to account for demographic changes and a future decrease in Germany's total labour force owing to the double ageing process.[7] However, the decrease in LF_t, which can be explained by the impending retirement of the baby boomer generations, does not interfere with the migration-induced effects that are the focus of this research, because it is factored into all the calculations.

The second factor – migration – has been modelled by dividing the number of immigrants in every year based on age and wage (two wage groups). Emigration is modelled by estimating the number of emigrants across population groups and by taking into account the significantly higher emigration of the non-integrators. This is necessary as statistics clearly show that foreigners, and thus refugee immigrants, constitute a larger share of emigrants (Statistisches Bundesamt, 2019).

[7] Growing life expectancy rates and low birth rates.

Integration is the third factor that affects the number of blue- and white-collar workers. New working-age immigrants, or who will attain working age within the projection period, who will not emigrate during the projection period will typically integrate first. This trend is modelled by assuming a logarithmic assimilation process (integration) with an individual duration for each wage group. All other immigrants are assigned to non-working population groups, thus increasing the total population as well as immigration costs. After completing the immigration process, a certain share of immigrants will become unemployed, while the majority will enter the specific wage groups of the labour force.

Data and Scenarios

Descriptive statistics and data

For the case study presented in this paper, 2014 has been considered the base year, as Germany witnessed a significant increase in (refugee) immigration in the following year. The main sources of data for the case are the national accounts of Germany (Federal Statistical Office of Germany, 2016a) and the survey of income and expenditure (EVS; Research Data Centre of the Statistical Offices of the Federal States (2015)).

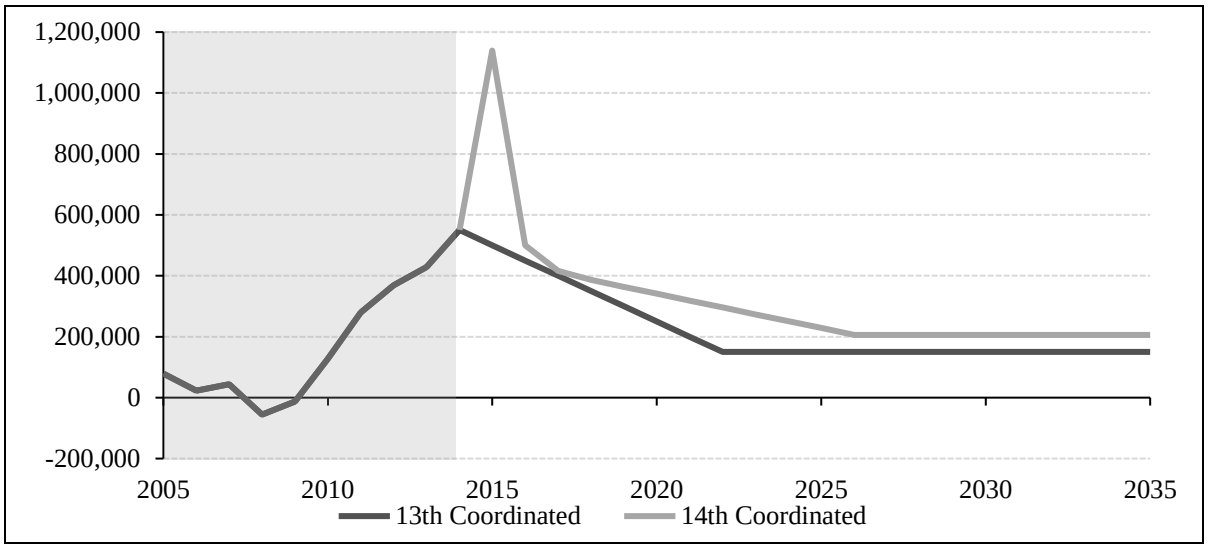
In 2015 and 2016, the average age of immigrants entering Germany was 31 years (Federal Statistical Office of Germany, 2019a), while that of the German population in 2014 was approximately 44 years (Federal Statistical Office of Germany, 2016b). Further, the proportion of immigrants aged 65 or below was 98.5 per cent (Federal Statistical Office of Germany, 2019a), while the proportion of the German population under 65 was only 78 per cent (Federal Statistical Office of Germany, 2016b). Thus, ceteris paribus, immigration could have initiated per-capita growth by increasing the working-age population.

For the rest of this paper, workers with an income equal to or higher than 150 per cent of the national average are considered white-collar workers. Income has been used instead of qualification levels as it is directly linked to the necessary wage sums of Equation 1. According to EVS, the initial distribution of workers in Germany in 2014 was as follows: 24.3 per cent white collar and 75.7 per cent blue collar. Of the foreigners living in Germany before the 2015 immigration, 21.6 per cent were white-collar, and 78.4 per cent were blue-collar workers. Equations 8 to 11 suggest that a high share of blue-collar workers among foreigners (and immigrants) can, if future (refugee) immigrants have the same income or qualification distributions as the foreigners already living in Germany, lead to a decrease in the wages of blue-collar workers and an increase in that of white-collar workers.

To measure the net growth effects of refugee immigration, two migration trends have been developed (Figure 1). First, a hypothetical migration movement without high immigration numbers is plotted, with the help of data obtained from the 13th coordinated population projection (Federal Statistical Office of Germany, 2015). The second migration trend is derived from the actual migration

figures since 2015 (Federal Statistical Office of Germany, 2019a) which are linearly adjusted to long-run net immigration of 206,000 for the years after 2018 as in the second immigration scenario of the 14th coordinated population projection (Federal Statistical Office of Germany, 2019b). A ceteris paribus comparison of the two migration trends allows for an estimation of the net effects of refugee immigration, because of the +1.1 million net immigrants in 2015 (Federal Statistical Office of Germany, 2016c), about 890,000 were refugees (Federal Ministry of the Interior, 2016). Overall, the number of net immigrants predicted in the 14th coordinated projection for the years between 2015 and 2035 is about 2 million higher.

Figure 1. Net immigration trend in Germany and future projections



Note: The grey area on the left side marks the pre-projection period and serves to illustrate the changing immigration in recent years.

Main Scenarios

Three scenarios have been hypothesised as part of the first step of the quantitative analysis. Per-capita net-growth effects are estimated with the help of a base scenario, which includes the basic assumption about immigrants' workgroup distribution (21.6 per cent vs. 78.4 per cent) derived from the dataset and probable integration times.

An average integration time of 6 years is considered for blue-collar workers, following the work by Manthei and Raffelhüschen (2018). This assumption might, however, be slightly optimistic because experts have offered widely differing opinions in the literature.[8] The integration process for white-collar workers is set at 9 years, which is 1.5 times longer than for that for blue-collar workers. This may seem surprising as high-skilled individuals with, for example, good command over English can communicate with most natives before they learn the host country's language. Further, they may likely adapt to new

[8] Liebig (2007), for example, finds the general integration period to be two years longer.

situations faster than low-skilled individuals. However, longer integration time for white-collar workers is justified because in jobs requiring high qualification levels, speaking the native language is extremely important. Further, high-skilled immigrants may first work in jobs below their qualification levels to gain financial security. Moreover, the process of getting one's qualification—achieved in the home country—acknowledged by German standards, which is required by many jobs, may be time-consuming for the immigrant applicants.[9]

Because the assumptions of integration time and qualification distribution are riddled with uncertainty, two other scenarios – a highly pessimistic and a highly optimistic – are presented (Table 1). These scenarios serve as the lower (pessimistic scenario) and upper limit (optimistic scenario) of a result corridor. In the pessimistic scenario, integration times are multiplied by 1.5, whereas in the optimistic scenario, they are multiplied by 0.5. However, if the model is implemented correctly, the different integration times should, realistically, only influence the chronological sequence of growth, not the extent of long-term net growth.

In the optimistic scenario, the qualification distribution of immigrants is assumed to be identical to that of the natives in the host country. The share of white-collar workers in the pessimistic scenario is based on the International Standard Classification of Education (ISCED11-A) of refugee immigrants in Germany.[10] According to data from the German Institute of Economic Research (2017), about 17 per cent of the refugees entering Germany in 2016 were highly qualified, belonging to ISCED11-A level 6 or higher.

Table 1. Overview of the main scenarios

	Pessimistic	**Base**	**Optimistic**
Integration Time (White Collar)	12 years	9 years	6 years
Integration Time (Blue Collar)	9 years	6 years	3 years
Share of White-Collar Qualifications	17 per cent	21.6 per cent	24.3 per cent
Share of Blue-Collar Qualifications	83 per cent	78.4 per cent	75.7 per cent

Sensitivity Analysis (Single Variable Effects)

In the second step of the quantitative analysis, the impact of individual variables has been assessed. To examine the effect of each variable, the above three scenarios have been modelled without the concerned variable or by keeping it constant. For example, to understand the effects of age on per-capita

[9] Also, companies, for example, in Germany, have reservations about employing refugees. In 2016, a survey among 354 companies found that only 10 percent employed refugees (Ellers et al., 2016).

[10] The UNESCO introduced the *International Standard Classification of Education* to facilitate comparison of educational achievements between different countries. Education is segmented into 10 levels in the 2011 version (ISCED11). In this paper, the categorization attainment (A) is used for individuals who graduated in their respective segment (ISCED11-A).

economic growth, the same age structure is assumed for immigrants and residents in the three scenarios. Similarly, to study the effects of integration time, the same integration duration is applied. The influence of migration-related government consumption on per-capita growth is assessed by modelling the three main scenarios without accounting for consumption changes. The results have been then compared with those from the first step of the quantitative analysis. A similar comparative approach has been used to highlight the influence of state capital and foreign capital inflows on per-capita growth. To understand the effect of each, the three main scenarios have been calculated without the said variable. The influence of migration-related wage adjustments has been determined by keeping wages constant over time across the three main scenarios and comparing the results with those from the first step. Finally, the significance of relative price development is determined by keeping the relative factor prices constant in the three main scenarios.

Table 2. Overview of single-variable effects

Variable	**Changes to the Main Scenarios**
Age Structure	Age structure is the same that of the domestic population
Qualifications	Qualifications are the same as those in the base scenario
Integration Time	Integration times are the same as those in the base scenario
State Consumption	State consumption is fixed over time
State Capital Stock	State capital stock is fixed over time
Private Capital Stock	No capital inflows from abroad
Wage Adjustments	Wages are fixed over time
Relative Price Development	Relative factor prices are fixed over time

Results

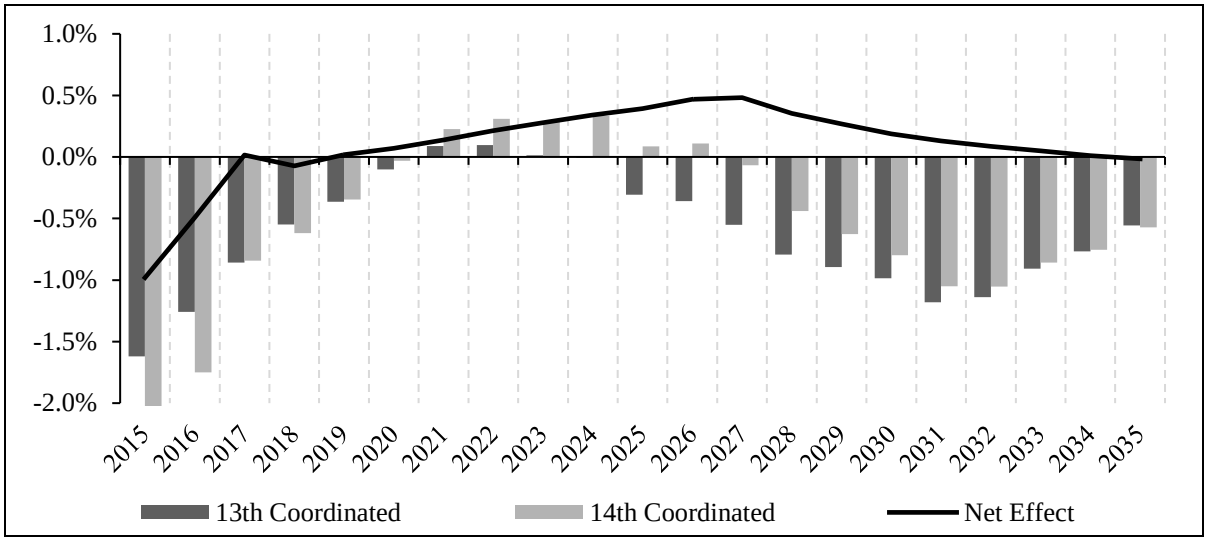
Main Scenario Results

Figure 2 shows the yearly per-capita growth effects of both migration trends in the base scenario. As expected, in the first few years, when an assumed integration process delays the newly migrated workers from entering the labour market directly, per-capita growth effects are negative.[11] They are also negative under both migration trends for most years of the projection period and only become slightly positive between 2021 and 2026. While this is mainly due to (e)migration in the early years, the negative growth effects after 2026 are primarily the result of demographic changes following the retirement of the baby boomer generation. As the 14th coordinated population projection includes higher emigration rates, the

[11] That this occurs even at lower migration rates is because even without the increase in immigration in 2015, immigration was at a fairly high level. In 2015, Germany had a total of 1.2 million immigrants and 700,000 emigrants (Federal Statistical Office of Germany, 2017).

negative per-capita growth effects in the second migration trend (light grey bars) are stronger at first. This is why the net effect of refugee immigration (dashed line) is also negative in the initial projection years. The break-even point is reached in the year 2021, after which the per-capita net growth effects of refugee immigration remain positive until the year 2026. Subsequently, the net effect declines until the per-capita growth effects of both migration trends converge. These results suggest that refugee immigration in Germany could indeed have a positive effect on its per-capita growth in some years.

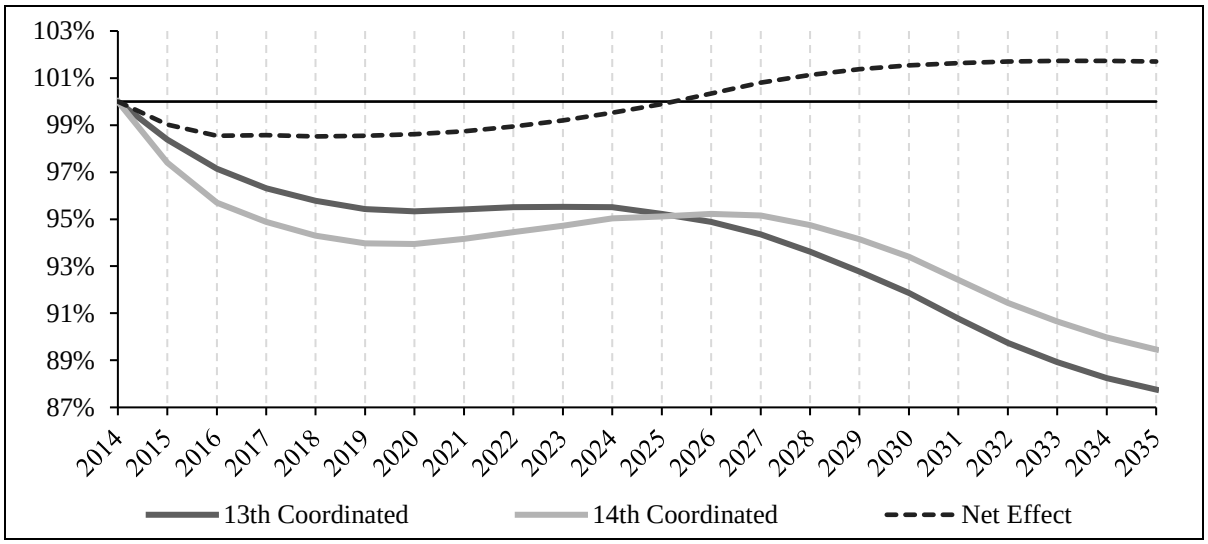
Figure 2. Yearly growth effects (per-capita) in the *base* scenario.



Note: The zigzag course in 2017/2018 is data-driven as the number of emigrants dropped sharply in 2017 (in the 14th coordinated).

Given that long-term growth effects are of greater interest, Figure 3 displays the aggregated per-capita growth effect across the years of the projection period. In Figure 2, the per-capita growth effects are mainly negative across both migration trends – 13th coordinated (dark grey line) and 14th coordinated (light grey line) – with only a short period of slightly positive effects that cannot compensate for the first few periods. However, the net effect (dashed line) in Figure 3 reaches a break-even point in 2026 and stabilises with a long-term positive growth effect of approximately +1.70 per cent. This result confirms that in Figure 2, suggesting that refugee immigration could lead to long-term per-capita growth even with a below-average qualification structure.

Figure 3. Aggregated growth effects (per-capita) of the *base* scenario.

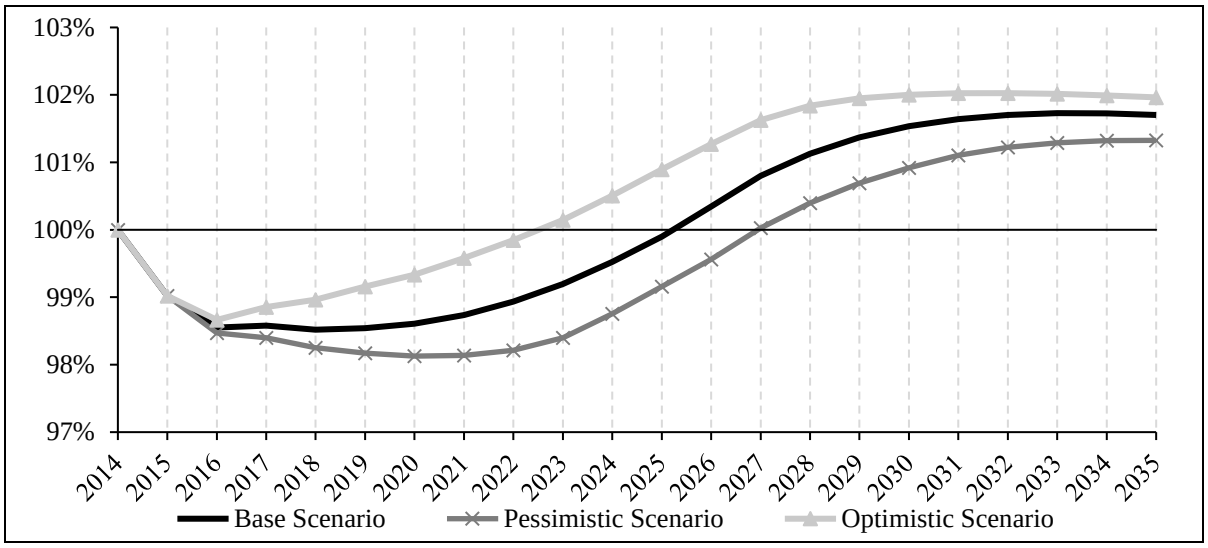


It is important to note that the assumptions described in the Main Scenarios subsection are subject to uncertainty. Therefore, Figure 4 shows the net per-capita growth effects of the pessimistic and optimistic scenarios in relation to the base scenario. As expected, the curve of the pessimistic scenario (dark grey line) is below that of the base scenario. While a longer integration period shifts the break-even point to the right, it is only delayed by around two years and not by three years, as assumed in this scenario. The long-term net growth of +1.33 per cent is lower than that of the base scenario, which highlights the importance of the qualification structure of the immigrants.

The curve of the optimistic scenario (light grey line) lies above that of the base scenario. Here, the break-even point is reached between the years 2022 and 2023, which is almost 3 years earlier than the base case. Further, long-term growth is the highest at +1.96 per cent at the end of the projection period. Thus, the results of the optimistic scenario confirm the implications of the pessimistic scenario.

In summary, the analysis of the main scenarios suggests that refugee immigration can lead to positive long-term per-capita net growth, even if the refugees are on average less qualified than the native population. The attainment of the break-even point is closely linked to the duration of integration, and the extent of growth is closely related to the qualification structure of the refugee immigrants.

Figure 4. Aggregated net growth effects (per-capita) of the three main scenarios.



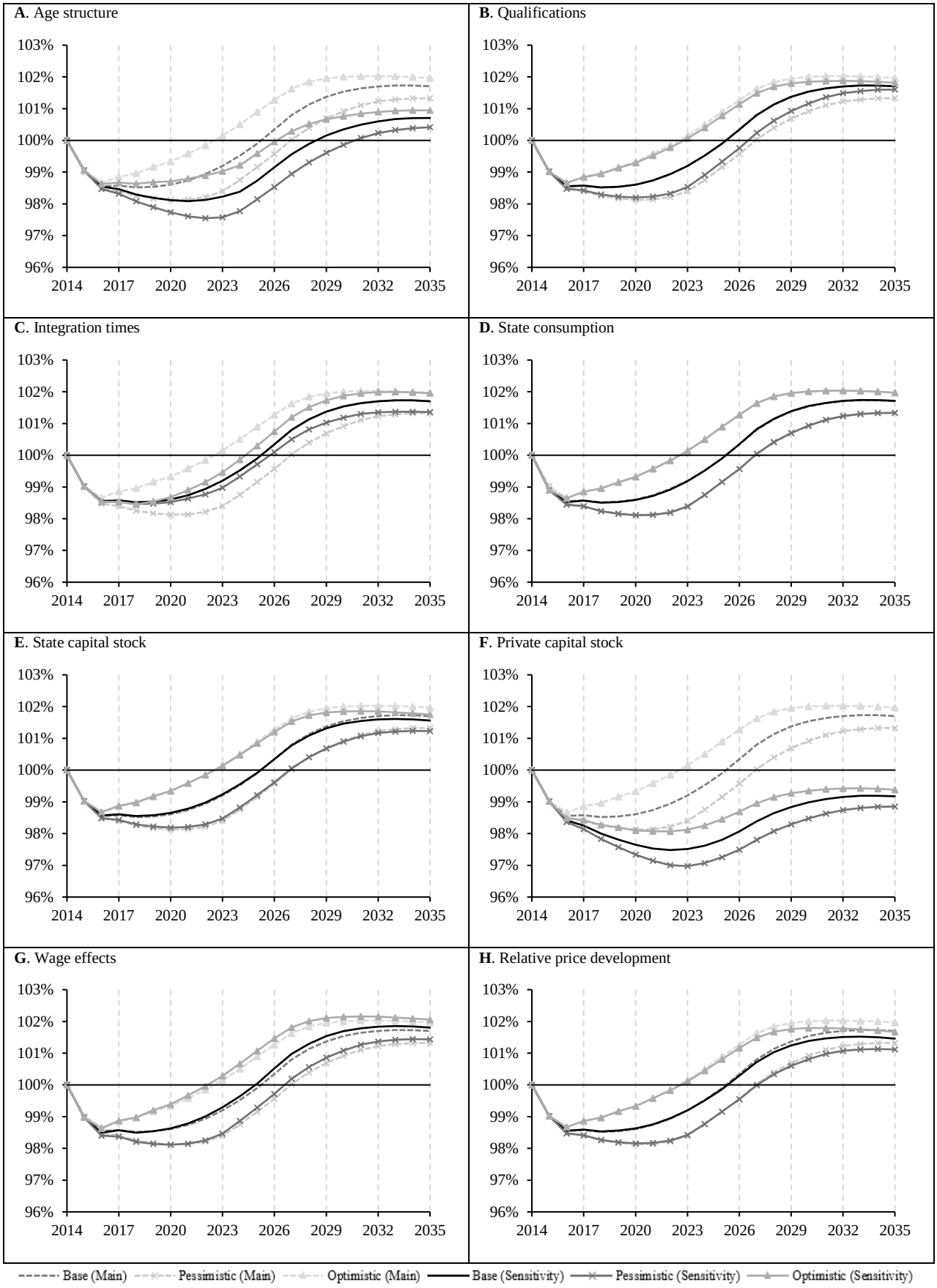
Sensitivity Analysis (Single Variable Results)

In this section, the results of the main scenarios are compared with those of individual variables introduced in the Single Variable Effects subsection. As mentioned, the immigrants' age structure has a strong influence on the per-capita growth trend. Figure 5.A clarifies that without a favourable age structure of refugees, per-capita growth will be significantly lower in all three scenarios, by about one percentage point each (thus, half as strong). These results confirm the findings of Boubtane, Dumont and Rault (2016) and highlight the impact of age structure effects on per-capita growth.

The impact of immigrants' qualification structure is shown in Figure 5.B. Without different qualification structures, all six curves show similar trends for most of the projected years. Only in the second half of the projection period do the curves without qualification differences (solid lines) deviate from those of the main scenarios (dashed lines). Towards the end of the projection period, all the curves converge. This result implies that integration time only has an impact on the timing of growth, but the qualification structure seems to be a significant variable determining the long-term level of growth. The time lags further indicate that the impact of the higher wages of white-collar workers exceeds their slightly longer integration times.

A similar result is evident in Figure 5.C, which shows the effects of the integration period on economic growth. Alignment in the integration times of the three scenarios leads to significant variation in the results over time. Given the same integration time (solid lines), the curves of all three scenarios reach the break-even point after a similar amount of time (2024 to 2026). However, the final growth levels seem to depend only on qualifications, as the aggregated net growth lines converge with those of the main scenarios (dashed lines) at the end of the projection period. This confirms initial expectations regarding the influence of integration time (Main Scenarios subsection) and the conclusions from Figure 5.B.

Figure 5. Sensitivity Analysis: Aggregated net growth effects (per-capita)



The effects of migration-related changes in government consumption on growth are negligible, as shown in Figure 5.D. With a GDP of 2.9 trillion euros in 2014, Germany's economic growth is minimally influenced by integration costs. The effects are only evident in the first years of the projection period when the costs are the highest.

Figure 5.E shows that a migration-related change in the state capital stock has a slightly greater effect than state consumption. Preventing the state capital stock from falling in response to the decline in investment driven by integration costs changes the relative price development of capital to labour. Although a higher state capital stock leads to a smaller negative growth in absolute terms under both migration trends,[12] the net effect of refugee immigration is different. It is mostly driven by the relative price of capital to labour, which in turn depends on the size of the state capital stock. Greater immigration can lead to a greater decrease in the state capital stock because of higher integration costs. This would dampen the effects of an increase in the private capital stock and thus weaken the development of the relative price of capital. In sum, financing integration costs through borrowing instead of cutting investments may have the same impact on economic growth as an expansionary fiscal policy and should be preferred to cuts in investments.

Figure 5.F shows the per-capita growth results without migration-induced capital inflows from abroad. Without such changes to the private capital stock size, while overall economic growth remains positive because of the large population,[13] long-term per-capita growth turns negative. This finding underscores the importance of capital inflows, without which a negative correlation can be expected between per-capita growth and refugee immigration, even if the qualification structure of refugees is the same as that of the natives (optimistic scenario: -0.62 per cent). With a poorer qualification structure, the per-capita economic output can decrease further by up to –1.15 per cent (pessimistic scenario). The model confirms this relationship, inter alia, by assuming partial financing of integration costs through investment cuts.

The effects of fixed wages on growth are plotted in Figure 5.G. If wages do not decline with migration-induced higher labour supply, for example, because of certain wage rigidities, more refugee immigration can lead to higher per-capita growth. This correlation between higher wages and higher growth seems plausible. However, the results also show that the increase in labour supply from immigration harms wages, which is detrimental to the local population. Importantly, the wage calculations point to a limitation in the model: the elasticities of wages and capital assumed in Equations 7, 10 and 12 may not exactly reflect the changes in relative prices that would occur in reality.

The significance of relative price development is captured in Figure 5.H. Without any adjustments to the relation of factor prices, the net per-capita growth as a result of refugee immigration is likely to be low in all three scenarios. This can be attributed to the stronger influence of higher wages

[12] With a fixed state capital stock, the aggregated growth in the 14th coordinated projection is –9.78 percent. Without it, it is –10.62 percent.

[13] In the base scenario, the overall economic growth of the GDP without capital inflows is +0.83 percent.

in the main scenarios compared to that of higher capital stock in the calculations with fixed relative prices. However, even without relative factor price adjustments, the net per-capita growth effects of refugee immigration figures would be positive by +1.12 per cent to +1.67 per cent.

Conclusion

Refugee immigration is currently one of the most crucial themes in European political discourse, and it is likely to remain so in the foreseeable future. The economic consequences associated with refugee immigration, especially in countries deeply affected by it like Germany, can significantly affect the lives of the European population. This study examined the long-term per-capita growth effects of refugee immigration with the help of an augmented Cobb–Douglas production model and a two-step quantitative analysis that explored a range of economic scenarios.

The results indicate that refugee immigration can lead to long-term per-capita growth. Key to the development of per-capita growth is the age structure of refugees and, to a slightly lesser degree, their qualification structure. The length of time needed by refugee immigrants to integrate mainly determines the time to reach the break-even point. Interestingly, the results show that private capital stock has the greatest impact on per-capita growth. Without a migration-related increase in the available private capital stock in the host country, positive per-capita growth is unlikely even under optimistic assumptions. In fact, the per-capita economic output could drop significantly.

The effects of refugee immigration on the capital stock in the host country have not yet been conclusively researched. Thus, it is difficult to definitively assert if refugee immigration leads to long-term per-capita economic growth in the host country. Nonetheless, some political implications can be drawn from these results. First, a young age distribution among immigrants is beneficial to the local population and therefore worthwhile to pursue. Migration policies framed accordingly could not only promote economic growth but also counter the undesirable effects of demographic changes. These benefits can be enhanced if immigration can bring in highly qualified individuals. In fact, this may also have a positive impact on the human capital stock. Reducing barriers to capital inflows, however, should be a policy objective regardless of migration. Similarly, short-term integration costs should not be financed through investment cuts, irrespective of immigration, as it can result in a negative long-term effect on economic growth.

As the proposed model does not contain assumptions that are specific to Germany, the results of the case study may be generalised to other countries affected by refugee immigration.

References

Aldén, L., and Hammarstedt, M. (2019), Refugee Immigration and Public-Sector Finances: Evidence from Sweden, *FinanzArchiv*, 73, 297–322.

Bahnsen, L.C., Manthei, G., and Raffelhüschen, B. (2016), Die langfristigen Auswirkungen der Flüchtlingsintegration auf die fiskalische Nachhaltigkeit, *Zeitschrift für Staats- und Europawissenschaften*, 14, 483–502.

Becker, G.S. (1962), Investment in Human Capital: A Theoretical Analysis, in: Journal of Political Economy, 9–49.

Bonin, H. (2016), Gewinne der Integration: Berufliche Qualifikation und Integrationstempo entscheiden über die langfristigen fiskalischen Kosten der Aufnahme Geflüchteter, *böll.brief: Teilhabegesellschaft*, 1.

Boubtane, E., Dumont, J.-C., and Rault, C. (2016), Immigration and Economic Growth in the OECD Countries 1986-2006, *Oxford Economic Papers*, 68, 340–360.

Dustmann, C., Fasani, F., Frattini, T., Minale, L., and Schönberg, U. (2017), On the economics and politics of refugee migration, *Economic Policy*, 32, 497–550.

Ellers, S., Möckel, K., Rump, J., and Schabel, F. (2016), Integration von Flüchtlingen in den Deutschen Arbeitsmarkt, Institut für Beschäftigung und Employability, Mannheim.

Federal Ministry of the Interior (2016), 890.000 Asylsuchende im Jahr 2015, https://www.bmi.bund.de/SharedDocs/pressemitteilungen/DE/2016/09/asylsuchende-2015.html (Access Date: 2017-11-14).

Federal Office for Migration and Refugees (2016), IAB-BAMF-SOEP-Befragung von Geflüchteten: Überblick und erste Ergebnisse.

Federal Statistical Office of Germany (2015), Bevölkerung Deutschlands bis 2060 - Ergebnisse der 13. Koordinierten Bevölkerungsvorausberechnung, Wiesbaden.

Federal Statistical Office of Germany (2016a), Volkswirtschaftliche Gesamtrechnungen 2015: Detaillierte Jahresergebnisse, Fachserie, Wiesbaden.

Federal Statistical Office of Germany (2016b), Bevölkerung und Erwerbstätigkeit 2015. Bevölkerungsfortschreibung auf Grundlage des Zensus 2011, Wiesbaden.

Federal Statistical Office of Germany (2016c), Höchststände bei Zuwanderung und Wanderungsüberschuss in Deutschland, Wiesbaden.

Federal Statistical Office of Germany (2017), Bevölkerung und Erwerbstätigkeit: Wanderungen 2015, Wiesbaden.

Federal Statistical Office of Germany (2019a), Wanderungen zwischen Deutschland und dem Ausland: Deutschland, Jahre, Nationalität, Altersjahre.

Federal Statistical Office of Germany (2019b), Bevölkerung Deutschlands bis 2060: Ergebnisse der 14.

koordinierten Bevölkerungsvorausberechnung.

Fratzscher, M., and Junker, S. (2015), Integration von Flüchtlingen: Eine langfristig lohnende Investition, *DIW-Wochenbericht*, 82, 1083–1088.

German Institute for Economic Research (2017), IAB-BAMF-SOEP-Befragung von Geflüchteten 2016: Studiendesign, Feldergebnisse sowie Analysen zu schulischer wie beruflicher Qualifikation, Sprachkenntnissen sowie kognitiven Potenzialen, *Politikberatung kompakt*, 123, 1–86.

GfK Verein (2018), Challenges of Nations 2018 - eine Studie des GfK Vereins, GfK Verein, Nürnberg.

Haller, M. (2017), Die „Flüchtlingskrise" in den Medien, *OBS-Arbeitsheft*, 93, 1–182.

Hansen, M.F., Schultz-Nielsen, M.L., and Tranæs, T. (2017), The Fiscal Impact of Immigration to Welfare States of the Scandinavian Type, *Journal of Population Economics*, 30, 925–952.

Hentze, T., and Kolev, G. V (2016), Gesamtwirtschaftliche Effekte der Flüchtlingsmigration in Deutschland, *IW-Trends – Vierteljahresschrift zur empirischen Wirtschaftsforschung*, 43, 59–76.

Javorcik, B.S., Özden, Ç., Spatareanu, M., and Neagu, C. (2011), Migrant Networks and Foreign Direct Investment, *Journal of Development Economics*, 94, 231–241.

Kugler, M., and Rapoport, H. (2007), International Labor and Capital Flows: Complements or Substitutes?, *Economics Letters*, 94, 155–162.

Liebig, T. (2007), The Labour Market Integration of Immigrants in Germany, OECD Social, Employment and Migration Working Papers no.47.

Lundborg, P. (2013), Refugees' Employment Integration in Sweden: Cultural Distance and Labor Market Performance, *Review of International Economics*, 21, 219–232.

Lundborg, P., and Segerstrom, P.S. (2002), The growth and welfare effects of international mass migration, *Journal of International Economics*, 56, 177–204.

Manthei, G., and Raffelhüschen, B. (2018), Migration and Long-Term Fiscal Sustainability in Welfare Europe: A Case Study, *FinanzArchiv*, 74, 446–461.

Perch-Nielsen, S.L., Bättig, M.B., and Imboden, D. (2008), Exploring the link between climate change and migration, *Climatic Change*, 91, 375–393.

Piras, R. (2011), The Solow Growth Model With Endogenous Migration Flows and Congested Public Capital, *Economia Politica*, 28, 195–217.

Research Data Centre of the Statistical Offices of the Federal States (2015), Einkommens- und Verbrauchsstichprobe (EVS) 2013: Grundfile 5 - Haushaltsbuch (HB), Research Data Centre of the Statistical Offices of the Federal States, Düsseldorf.

Ruist, J. (2015), The Fiscal Cost of Refugee Immigration: The Example of Sweden, *Population and Development Review*, 41, 567–581.

Samuelson, P.A. (1948), International Trade and the Equalisation of Factor Prices, *The Economic Journal*, 58, 163.

Stark, O. (2017), Global Integration and World Migration, *ZEF-Discussion Papers on Development*

Policy.

Statistisches Bundesamt (2019), Bevölkerung und Erwerbstätigkeit: Wanderungen 2017, Fachserie 1 Reihe 1.2, Wiesbaden.

van Suntum, U., and Schultewolter, D. (2016), Das Costa Fast Gar Nix? Das Costa Ganz Viel! Kritik einer DIW-Rechnung zu den Ökonomischen Auswirkungen der Flüchtlinge, *Ifo-Schnelldienst*, 69, 30–38.

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