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Abstract

Following the Russian military invasion of Ukraine on February 24, 2022, a large wave of Ukrainian refugees arrived in Poland. By 2024, about 1 million Ukrainian refugees have settled in Poland, on top of about 1.5 million Ukrainians who had immigrated between 2014 and 2022, and about 0.9 million immigrants coming from other countries. In this paper we estimate the contribution of Ukrainian refugees, as well as economic migrants from Ukraine and immigrants from other source countries, to labour supply and economic growth in Poland. Using a unique survey dataset compiled at NBP, we are able to carefully account for the different socio-economic and demographic characteristics of these three distinct groups. We find that in 2021-23, immigrants contributed on average about 0.5 pp. to annual GDP growth per annum (18% of all growth), and 0.5 pp. (13% of all growth) in the preceding period 2013-21. While a significant group of pre-war Ukrainian immigrants left Poland after the Russian military invasion of their country, the contribution of labour of Ukrainian refugees alone amounted to 0.8 pp. per annum in 2021-23 (29% of all GDP growth). These contributions helped sustain economic growth in Poland despite the gradual decline in the dynamics of total factor productivity.

Keywords: refugees, immigration, labour supply, economic growth, Poland, Ukraine

JEL codes: E24, O47, F22, O15

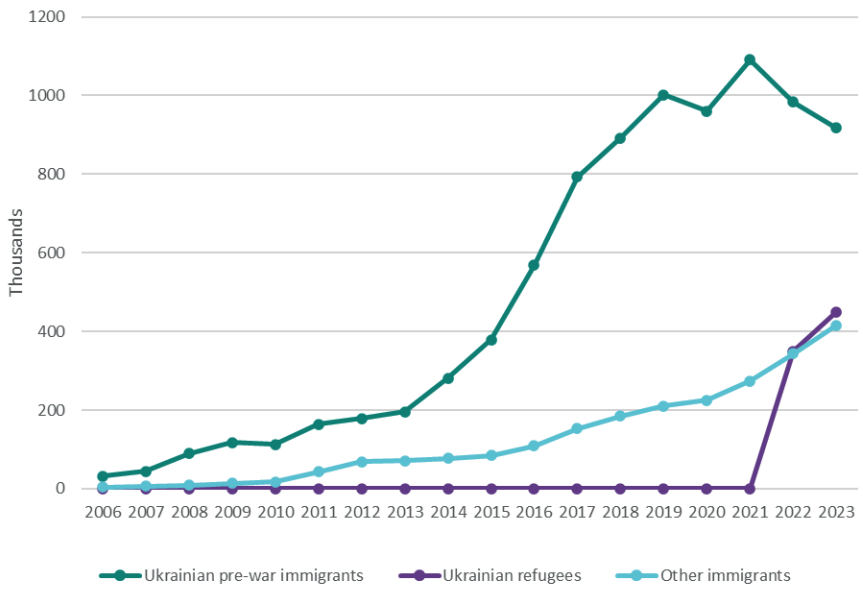
1. Introduction

Since 2014, Poland has been recording a systematic inflow of immigrants from Ukraine. By the end of 2021, about 1.5 million economic immigrants from this neighbouring country have settled in Poland; of those probably about 1.2 million found employment. This immigration was prompted inter alia by strong labour demand in Poland, relatively easy short-term work and residence permits (pull factors) as well as the Russian aggression on Ukraine in 2014 with an ensuing economic crisis there (push factors).

Unfortunately, for Ukraine matters were to change from bad to worse. On February 24, 2022 Russia began its full-scale military invasion of that country. Within just a few weeks from that date, about one-fourth of Ukrainians had to flee their homes, of which finally more than 6.1 million left their country finding their shelter abroad (UNHCR data, as of 24 Sep 2024). Only by the end of March 2022 the Polish-Ukrainian border was crossed by above 2.4 million Ukrainians, mostly women and children. In later months, however, the intensity of border traffic dropped remarkedly to the average level of about 0.7 million border crossings per month. Additionally this unprecedented wave partly dispersed as some refugees continued their journey to other EU countries or returned to their homes in Ukraine. About 1.5 million Ukrainian refugees stayed in Poland in April-May 2022, and by the end of 2022 their number stabilized at about 1 million. Simultaneously, about 0.2 million of pre-war Ukrainian immigrants left Poland, including a sizeable group of men who decided to fight for their country.

From the perspective of the host country, accommodating and providing support for such a massive wave of refugees is a challenge, particularly in the short run. In the longer run, however, it is also an opportunity as the immigrants find employment and contribute their human capital to the benefit of the host economy.

Figure 1. The number of employed immigrants in Poland.



Source: NBP.

Indeed, a significant fraction of the arriving immigrants and refugees sought and found employment (**Figure 1**).[1] According to NBP estimates, in 2023 there were about 1.8 million immigrant workers in the Polish economy, of which about 0.9 million were pre-war Ukrainian immigrants, about 0.5 million Ukrainian refugees and 0.4 million other immigrants. These numbers are also consistent with other estimates (Duszczyk et al., 2024). The number of immigrant workers began to rise steeply only in 2014, temporarily stabilized in 2019, and then shot up again in 2022 after the Russian full-scale military invasion of Ukraine.

The objective of the current paper is to carefully quantify the contribution of Ukrainian refugees and other immigrants to the labour force and economic growth in Poland. To this end, we employ a detailed growth accounting exercise. We update and extend our earlier calculations from Strzelecki et al. (2022), expanding our methodology to differentiate between Ukrainian refugees, economic (pre-war) immigrants from Ukraine and immigrants from other source countries. Using a unique dataset compiled at NBP, based on face-to-face surveys carried out among the Ukrainian immigrants and refugees in Poland, we are able to carefully account for the different socio-economic and demographic characteristics of these three distinct groups. For example, owing to a mobilization decree issued by the President of Ukraine (Decree 64/2022 dated 24 February 2022), forbidding most men aged 18-60 from leaving the country, the group of refugees was comprised predominantly of women and children; due to the forced character of their migration, arriving refugees were also less likely to speak Polish and have contacts in Poland, making them more likely to work below qualifications.

We find that in 2021-23, the effective labour input in Poland grew by about 1.4% per annum, of which Ukrainian refugees contributed 1.3 pp. on average (93% of all labour input growth), other immigrants added 0.3 pp. (22%), whereas returning pre-war Ukrainian migrants reduced this growth rate by 0.8 pp. (-58%). By contrast, in the preceding period 2013-21, arriving Ukrainian immigrants contributed about 0.7 pp. (25%) to the total 2.6% annual labour input growth, and other immigrants added about 0.1 pp. (5%).

These increases in labour supply were essential for sustaining Poland's economic growth in the last decade. According to our estimates, immigrants contributed on average about 0.5 pp. to annual GDP growth per annum in Poland (18% of all growth), compared to 0.5 pp. (13% of all growth) in the preceding period 2013-21. Specifically, the contribution of labour of Ukrainian refugees alone amounted to 0.8 pp. per annum (29% of all GDP growth in 2021-23).

The current paper is structured as follows. In Section 2 we provide a literature review. In Section 3 we describe the method and data. Sections 4-5 present the results. Section 6 concludes.

[1] The numbers provided in Fig.1 are consistent with official NBP projections. Please consult Section 3.3 on the details of their construction.

2. Literature review

The current paper studies the economic impacts of immigration, and specifically admitting refugees, on the host country. Specifically, it is closely related to three strands of literature: (i) studies describing and quantifying migration from Ukraine to Poland, (ii) studies quantifying the contribution of this migration to Poland's economic growth, and (iii) the literature looking more broadly on the economic effects of admitting refugees.

2.1 Three waves of migration from Ukraine to Poland

The contemporary migration of Ukrainians to Poland started with the political and economic transitions in Central and Eastern Europe in the late 1980s and early 1990s. However, until 2013 this migration was predominantly circular and limited in size, topping at about 0.2 million in 2010-13. It picked up significantly only in 2014, after the first Russian military aggression against Ukraine, which led to the annexation of Crimea, invasion and later a frozen conflict in Donbass, and a prolonged economic crisis in Ukraine. Over the years 2014-21, a vast majority of Ukrainian immigrants arrived in Poland for economic reasons. They were, in part, pushed to move by the economic hardships in their home country, but they were also attracted by strong labour demand in Poland, relatively easy short-term work and residence permits, as well as Poland's geographic, linguistic and cultural proximity. By contrast, after the Russian full-scale invasion of Ukraine which began on February 24, 2022, migration from Ukraine to Poland was almost completely forced.

Górny and van der Zwan (2024) found that the war context of migrations which took place in 2014-21, compared to the earlier ones, contributed to the increased permanency of Ukrainian migration, challenging the temporary mobility model which had been dominant prior to 2014. Also, instead of engaging primarily in temporary work in agriculture, the immigrants of 2014-21 located predominantly in cities and sought work across a broad spectrum of economic sectors (Strzelecki et al., 2022).

The Ukrainian refugees who moved to Poland in 2022-23 found themselves in a different situation than their compatriots who had arrived earlier. The forced character of their migration meant that their lives were full of uncertainty, they did not enter the Polish labour market as easily, and they were much less willing to settle in Poland permanently. According to survey results presented by Chmielewska-Kalińska et al. (2023), the majority of refugees were women (about 80%, compared to 54% among pre-2022 migrants); many of them could not speak any Polish (about 46%, compared to 2% among pre-2022 migrants) and planned to return to Ukraine after the war ends (about 56%, compared to 25% among pre-2022 migrants). The uncertainty in refugees' plans is also underscored by the fact that by October 2023, as many as 53% of school-age refugee children were still not enrolled in the Polish education system (Chrostowska, 2023).

Nevertheless, Ukrainian refugees in Poland largely followed the pre-2022 locations of Ukrainian economic migrants, as demonstrated by Gromadzki and Lewandowski (2022) based on early data on refugees coming to Poland between February and April 2022 (see also Górny and Kaczmarczyk, 2023). Gromadzki and Lewandowski (2022) also

emphasized the importance of skill mismatch, particularly prevalent among refugees finding their first job in Poland after forced migration. However, they did not find any impact of the refugee inflow on labour market outcomes of the Polish population and other migrants.

The process of gradual integration of Ukrainian refugees into the Polish labour market was further inspected by Strzelecki (2024). He found that while the average hourly wage of war refugees in 2022 was 55% lower than average in the Polish economy, this large discrepancy largely faded away by 2023, largely explained by changes in the knowledge of Polish language (which quickly improved among the refugees) and the type of employment contract (many employees switched from temporary to permanent contracts). In contrast, the raw wage gap of pre-2022 immigrants was relatively small (about 13%) and almost fully explained by features of immigrants (gender, education, age, region, big city dummy, occupation, sector). This is in line with the broader observation that linguistic barriers and the need to take care of a family member (usually a child) tend to be the biggest obstacle among Ukrainian refugees in entering the labour market in any host country (FRA, 2023).

2.2 How much are Ukrainian refugees contributing to the Polish economy?

From the perspective of the current study, the key difference between economic migrants and refugees consists in the forced character of refugees' movement. According to the UNHCR definition, refugees are "people who have fled war, violence, conflict or persecution and have crossed an international border to find safety in another country".[2] In the case of Ukraine, the definition applies to all Ukrainians fleeing their country after Russian full-scale invasion which began on February 24, 2022. As opposed to the earlier economic migrants, whose decision to move was shaped by both push and pull factors, refugees' migration was based on push factors only. Moreover – as it has been a common theme among Ukrainians entering Poland in February-April 2022 – the refugees often had to leave their assets behind and move to the first safe country, without an option choose their destination intentionally.

But how large exactly was the Ukrainian refugees' contribution to Poland's GDP? In Strzelecki et al. (2022), we have found that in 2013–2018 Ukrainian workers were increasing the effective labour supply in Poland by 0.8% per annum on average. This additional labour supply added about 0.5 pp. to Poland's annual GDP growth in each of those years. In cumulative terms, the additional million Ukrainian workers who arrived in Poland between 2013 and 2018 contributed about 13% of Poland's GDP growth in that period.

In comparison to that number, the contribution of refugees is expected to be smaller on average, given their demographics (e.g., many refugee women cannot work full time because of childrearing duties) and greater extent of labour market mismatch (e.g., about 46% refugees are overqualified for their jobs, compared to 33% of pre-2022 migrants, cf. Chmielewska-Kalińska et al., 2023). On the other hand, given the sheer

[2] https://www.unhcr.org/us/what-refugee [access: 10.09.2024]

number of refugees integrating into the Polish labour market, their reliance on labour incomes (80% of incomes of Ukrainian refugee households comes from work, cf. Deloitte 2024), and their favourable integration prospects compared to other refugees (e.g., educational profile, existing social networks, immediate access to employment, cf. OECD, 2022), this contribution may still be very sizeable. Using the same methodology as in Strzelecki et al. (2022), we calculate this contribution in this paper.

The two studies that are most closely related in scope are by Deloitte (2024) and Hagemejer and Kulesa (2024). Using a computable general equilibrium model, Deloitte (2024) have estimated that refugees from Ukraine contributed 0.7-1.1% to Poland's GDP in 2023, and in the long term this effect will grow to 0.9-1.35%. In their model, GDP gains were reduced due to increased competition on the labour market, increasing the unemployment rate by 0.18-0.3 pp. and slowing down real wage growth by 0.65-1.15% in 2023. In comparison, Caselli et al. (2024), using a semi-structural general equilibrium model for the euro area, have estimated that the recent increase in immigration (relative to pre-pandemic expectations), is expected to increase the level of euro-area potential output in 2030 by about 0.2%-0.7%. Finally, using a different computable general equilibrium model, Hagemejer and Kulesa (2024) have estimated that the contribution of immigration to economic growth in Poland amounted to 0.24 pp. on average throughout 2015-23, with a maximum contribution peaking at 0.41 pp. in 2021. This study did not factor in the distinction between economic migrants and refugees, though.

2.3 Refugees and the host economy: international context

After Russia invaded Ukraine, Poland (as well as other EU countries) opened their borders to Ukrainian refugees and allowed them to enter legally. In an international perspective, this has not been the usual case, though. For example, during the 2015-16 European refugee crisis, most asylum seekers (largely from Syria, Afghanistan and Iraq) entered the EU illegally across the Mediterranean sea. Due to the lack of legal residence status, they were largely prohibited from legal employment and faced the risk of being relocated or even deported to the country of origin.

Also the demographics of refugees may vary. OECD (2022) compared the 2022 wave of Ukrainian refugees to the earlier waves of refugees arriving in Europe, emphasizing that "while the 'average' refugee in the context 2014-17 inflows was a relatively low-educated young man, in the case of the 2022 Ukrainian refugees, it is more likely to be a tertiary educated woman, often with accompanying children." (OECD, 2022, p. 11). This stark difference – given that education is the prime predictor of worker productivity – adds an important wedge over the headline OECD result that the overall estimated increase in the number of employed workers after the arrival of Ukrainian refugees was about twice as large as that of the 2014-17 refugee inflows. Indeed, after multiplying the expected increase in employment by the expected labour productivity, the predicted gap is becoming even larger.[3]

[3] OECD's positive expectation was later confirmed: according to NBP estimates about 0.4 of 1 million (40%) Ukrainian refugees to Poland were employed at the end of 2023.

In parallel with receiving legal recognition and support, Ukrainian refugees were granted immediate labour market access in Poland. In contrast, refugees around the world have often been temporarily barred from the labour market, which hampered their integration with the host economy, accumulation of human capital, and reduced their earning potential (Deloitte, 2024). For instance, during the 2015 refugee crisis, 26 out of 30 European countries imposed such employment bans on over 1 million refugees, resulting in an estimated GDP loss of 38 billion euro over 8 years (Fasani et al., 2021). Even with regard to the current Ukrainian refugee migration, there is noticeable cross-country variation in policies, eventually leading to very different employment rates. Specifically, Germany incentivizes refugees to first enroll in a German language course while granting them access to its relatively generous social welfare system (Honorati et al., 2024); in Poland and Czechia, subsidies for refugees are lower and there is no clear policy to teach the refugees national languages first. In effect, in 2023 the employment rate of refugees exceeded 50% in Poland while remaining below 30% in Germany (FRA, 2023; Kosyakova et al., 2024).

Labour market inclusion of Ukrainian refugees could have been also indirectly facilitated by refraining from any refugee dispersal policies. Prior to 2022, refugees have been frequently geographically dispersed after arrival to spread the cost of hosting them, ease the stress on the housing market and public services, and to avoid creating ethnic enclaves (Deloitte, 2024). In Europe, country-level refugee dispersal policies are further subjected to the EU-wide pact on migration and asylum, adopted on 14 May 2024. However, such policies frequently hamper the integration of refugees in the local labour market by pushing at least some of the refugees into regions with little employment opportunities and depriving them of positive network effects associated with the presence of co-nationals (Fasani et al., 2022). Specifically co-nationals can provide important information to refugees about employment opportunities, reducing the extent of labour market mismatch (Battisti et al., 2022; Deloitte, 2024). Clustering of Ukrainian immigrants and refugees across Poland has been confirmed by Gromadzki and Lewandowski (2022).

An additional phenomenon to observe is a noticeable share of refugees continuing their jobs in Ukraine thanks to the opportunity to work remotely (according to a survey carried out in 2022, this applied to 20% of working women and 31% of working men, see FRA, 2023, p. 42). This is a sizeable group of Ukrainian refugees who contribute to consumption demand in the host country, but not to its output or labour market.

3. Method and data

3.1 Method

We proceed as follows. First, we estimate the raw number of (a) Ukrainian immigrants, (b) Ukrainian refugees (in 2022-23), (c) other immigrants to Poland. Second, using detailed data on socio-economic and demographic characteristics of these three distinct groups, we approximate their productivity-adjusted hours worked. Third, we carry out a growth accounting exercise, which allows us to quantify the contributions of these three groups to Poland's economic growth.

3.1.1 Growth accounting

The growth accounting exercise carried out in this study closely follows Fernald (2012a,b), Gradzewicz et al. (2018) and Strzelecki et al. (2022). We carry out decompositions of the constant-returns-to-scale aggregate production function

$$Y = A \cdot F(Util \cdot K(K_1, K_2, \dots, K_n),\ L(L_1, L_2, \dots, L_m)),$$

based on data on output of the Polish economy *Y* (real GDP in constant prices) and the flows of services of inputs: capital *K* and labour *L*. Each of these two inputs is itself an aggregate of a number of capital or labour types (*n* and *m* types, respectively), differing in their marginal productivity. Flows of capital services are assumed to be proportional to the capital stock. The (time-varying) coefficient of proportionality is the capacity utilization rate, denoted as $Util$. The aggregate production function is augmented with a Hicks-neutral technological change component *A*, interpreted as total factor productivity (TFP) adjusted for capacity utilization.

Having denoted the growth rates of the respective variables as $\hat{x} = ln\left(\frac{x_t}{x_{t-1}}\right)$, the Törnquist index of output growth is written down as follows:

$$\hat{Y} = \alpha\widehat{K} + \alpha\widehat{Util} + (1-\alpha)\hat{L} + \hat{A},$$

where the growth rate of the capital input (services provided by capital) is given by $\widehat{K} = c_1^K\widehat{K_1} + c_2^K\widehat{K_2} + \cdots + c_n^K\widehat{K_n}$, whereas the growth rate of the labour input (labour services) is $\hat{L} = c_1^L\hat{L}_1 + c_2^L\hat{L}_2 + \cdots c_m^L\widehat{L_m}$. In accordance with the generality of the above Törnquist index, allowing us to refrain from making exact functional assumptions on the aggregate production function, the components of input aggregates are weighted proportionally to their (time-varying) shares in total remuneration of the respective inputs: c_i^K is the share of remuneration of K_i in *K*, c_i^L is the share of remuneration of L_i in *L*, α is the capital's share of GDP.[4] Each of these shares is computed as an arithmetic average of the respective values at times *t*-1 and *t*.

[4] The capital's share of GDP is computed based on annual data on GDP, gross operating surplus, total compensation of employees, and gross mixed income. We assume that mixed income of proprietors is split into the remuneration of capital and labour in the same proportion as in the rest of the economy.

This output growth decomposition rests on the usual set of neoclassical assumptions: firms maximize their profits, so that marginal products are proportional to marginal costs of production, and factor shares are equal to factor partial elasticities.

3.1.2 The labour input

Accounting for differences in unit productivity across the various capital and labour types improves the aggregation procedure and makes it more accurate than simple summation. It also allows us to decompose input growth into the contributions of increases in raw quantity and changes in composition. Denoting the raw sum of capital inputs as $K_{raw} = K_1 + K_2 + \ldots + K_n$ and the raw sum of hours worked in the economy as $L_{raw} = L_1 + L_2 + \ldots + L_m$, we define growth in the *composition component* of capital and labour, respectively, as

$$\widehat{Q_K} = \hat{K} - \widehat{K_{raw}}, \qquad \widehat{Q_L} = \hat{L} - \widehat{L_{raw}}.$$

Given that growth in the capital composition component has been essentially zero in Poland since 2000 (Gradzewicz et al., 2018; Strzelecki et al., 2022) and the focus of the current paper is on labour, in the following paragraphs we will discuss exclusively the labour composition component Q_L.

Growth in the labour composition component, i.e. the difference between productivity-weighted and unweighted hours worked, captures the dynamic effects of shifts in shares of various types of labour in its total remuneration. Specifically increases in the labour composition component reflect increases in the share of relatively more productive labour types in the raw labour aggregate. The labour composition component may rise, for instance, due to an increase in the share of (relatively more productive) people with tertiary education in the workforce.

We distinguish, beside native workers, three groups of immigrant workers: (i) immigrants from Ukraine, (ii) refugees from Ukraine (2022-23), and (iii) immigrants from other countries. We then stratify each of these worker groups by their educational attainment, age category, gender, occupation and sector.

Technically, in line with the definition of the labour input L_t and following Bell et al. (2005), we decompose labour input growth into the contributions of respective groups of workers $i = 1, \ldots, m$, using the Törnqvist index:

$$\widehat{L_t} = \Delta \ln L_t = \sum_{i=1}^{m} \left(\frac{c_{i,t}^L + c_{i,t-1}^L}{2} \right) \ln \left(\frac{H_{i,t}}{H_{i,t-1}} \right),$$

where $H_{i,t}$ represents total hours worked by workers from group *i* at time *t* and $c_{i,t}^L$ is the share of labour compensation of group *i* at time *t*. The weights in the index are given by average shares in the periods *t* and *t*−1. Growth rates of the composition-adjusted labour input measures are then obtained as a weighted average of growth rates of total hours worked by groups of workers, with weights given by their respective shares in total labour compensation. Hence the productivity-adjusted index grows faster than the

unadjusted one if and only if the groups with relatively higher wages experience relatively faster growth in hours worked.

As mentioned above, we then subsequently break down growth in the total labour input into the contributions of "quantity" and "quality" components:

$$\widehat{L_t} = \widehat{H_t} + \widehat{Q_{L,t}} = \widehat{E_t} + \widehat{h_t} + \widehat{Q_{L,t}},$$

where E_t represents total employment (number of workers), h_t represents average hours worked per worker (i.e., $H_t = E_t h_t$), and $Q_{L,t}$ is the labour composition ("quality") component.

Using the properties of the Törnqvist index, we also calculate the separate contributions of each of the worker features taken into account (belonging to one of the three immigrant groups, educational attainment, age, gender, sector, occupation) to the growth of the productivity-adjusted labour input. Of particular interest to the current study is the decomposition of labour input growth into the contributions of native and immigrant workers:

$$\hat{L} = \widehat{L_{PL}} + \widehat{L_{UA,immigrant}} + \widehat{L_{UA,refugee}} + \widehat{L_{other}}.$$

Next, for each group $j \in \{PL;\ UA, immigrant; UA, refugee; other\}$ we take advantage of within-group variation in worker types to further decompose their respective labour input growth measures into the growth in total hours worked by the group and changes in its labour composition,

$$\widehat{L_J} = \widehat{E_J} + \widehat{h_J} + \widehat{Q_{L,J}}.$$

With these decompositions in hand we proceed to calculate their contributions to economic growth.

3.2 Data

The data on Poland's annual GDP (Y_t), factor shares (α_t), and gross fixed capital formation across four capital categories (buildings and structures excluding dwellings, transport equipment, other machinery and equipment, and intangible fixed assets), have been taken from Eurostat. The procedure for computing the productivity-adjusted stock of physical capital (K_t) is exactly the same as in Gradzewicz et al. (2018) and Strzelecki et al. (2022). In turn, our data on capacity utilization comes from the NBP Quick Monitoring Survey (NBP, 2024). Consistently with the characteristics of this dataset, we apply the utilization rate to capital only; labour utilization rates are already included in our direct measure of hours worked per worker.

The labour supply of native Polish workers across a number of worker groups has been calculated based on Polish Labour Force Survey (LFS) microdata from Statistics Poland. The quarterly sample size in the LFS varies between about 50 and 100 thousand individuals. This dataset contains most comprehensive information regarding the labour market in Poland in the period 1995–2023. It focuses however on the native

population, whereas the immigrant population is highly underestimated in this survey[5]. The group of immigrants observed in the LFS is also highly biased due to the fact that the surveys were carried out mostly in Polish and on a voluntary basis.

To obtain unbiased estimates of labour supply of immigrant workers, we have eliminated all the information about immigrant workers from the LFS survey. Instead we used the data from dedicated surveys carried out in 2019, 2022 and 2023 by Narodowy Bank Polski, covering large samples of immigrants from Ukraine (about 4 thousand each year) in all major regions of Poland. Based on this data we formulated our assumptions regarding the composition of immigrants. Next, we applied such breakdown to NBP estimates of the total number of immigrants (see below) by category: (i) Ukrainians who came to Poland before 2022, (ii) Ukrainian refugees who came since 2022, and (iii) other immigrants. Thus constructed data was then used to supplement the database of the native workers from LFS.

There are two structural breaks present in the original Polish LFS data, in 2011 and 2019, occurring because of patchy updates of LFS data after population censuses. To eliminate the first break, we have implemented a consistent backward data revision proposed by Saczuk (2014). For the period after 2018, however, no equivalent revision procedure has been proposed, and thus we use the official data from Statistics Poland publications. In effect, we allow for a discontinuity in the year 2019, in which the Census 2021 update came into force.[6]

An additional structural break in the Polish LFS data, that cannot be fully corrected, occurs in 2020-21. It is the consequence of the following methodological changes implemented, in line with the EU Framework Regulation for Social Statistics (IESS FR): (i) a change in the construction of survey questionnaire in 2021; (ii) a shift from (computer-assisted) personal interviews to telephone interviews from 2020 onwards, triggered initially by the Covid-19 pandemic (see Saczuk and Zajkowska, 2024, for a detailed discussion).

[5] Polish LFS is aimed to be representative only for residents (i.e. persons staying or planning to stay in Poland for the period of at least 12 months), not considering e.g. any short-term immigrants. That is why even after the inflow of refugees in 2022 the share of surveyed persons without Polish citizenship among the employed never exceeded 1.5% of the total LFS sample, while according to data published by the Polish Social Security Institution (ZUS) the share of persons without Polish citizenship among active contributors to the Polish Social Security System in late 2023 was about 7%. Our estimates suggest that after accounting for irregular employment (seasonal work or shadow economy) the share of immigrant workers in total employment in 2023 was even higher, close to 10%.

[6] The one-off adjustment after Census 2021 should be distributed among all years 2011-2019. As it is not clear how to do it, we decided that keeping it in one year will be clearer. We estimate that the statistical disturbance in employment due to this adjustment shifts employment of native workers upwards by maximum 300 thousand, and the annual employment growth rate – by up to 1.7 percentage points in 2019.

3.3 Estimates of immigrants' labour input

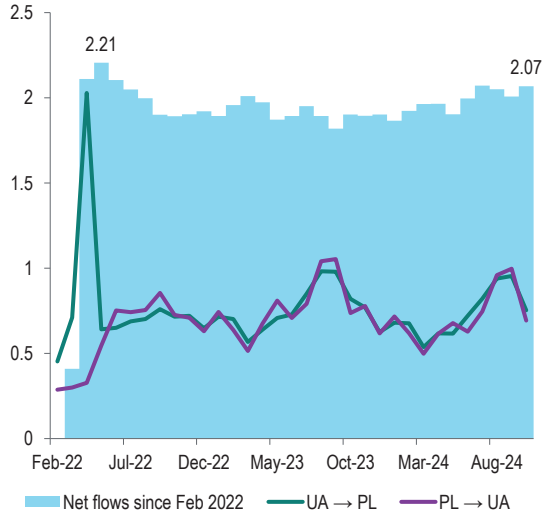
There are many independent data sources containing pieces of information on particular groups of foreign citizens coming to Poland but, alas, there is no single, consistent information system regarding all immigrants at once. This makes estimation of the exact number of immigrants residing in Poland, as well as of those undertaking economic activity, a challenging and multifaceted process. In this article we focus primarily on the immigrants' labour input.

According to Office for Foreigners data as of 30 November 2024, the total number of Ukrainian citizens holding valid documents legalizing their current stay in Poland amounted to slightly above 1.5 million, out of about 2 million foreigners in total. At the same time, according to registration data (PESEL database provided by the Ministry of Digital Affairs), as of 12 November 2024 there were 983.3 thousand Ukrainian refugees with temporary protection (refugee) status considered within this group (**Figure 3**), of which about 564 thousand (57.3%) were adults aged 18-64 (about 69% of them were women)[7]. A significant fraction of them has managed to enter the Polish labour market. The numbers mentioned above do not include, however, those allowed to come within the scope of visa-free cross-border movement of persons[8], as well as all migrants without legalization of their current stay. There is no official register data available which could help us fully identify and count the representatives of the two latter groups.

To a degree, also border traffic data illustrate the scale and intensity of migration flows. According to information obtained from the Polish Border Guard, since 2022, except for a short period directly after the war outbreak in February and March 2022, the number of border crossings from Ukraine to Poland oscillated between 600k and 800k persons per month (**Figure 2**). The average net monthly inflow was only slightly positive, though, stabilizing at about 5k persons after the initial wave of refugees had arrived (+1.7 million in March 2022). Nonetheless, those statistics allow neither for identifying illegal migrants nor for distinguishing the group of persons intending to re-emigrate further to other EU countries. Thus, the variation of available estimates of Ukrainian population in Poland appears to be relatively wide, ranging from 1.5 million legal stays up to over 3 million at the highest[9]. In our judgment, the total population of Ukrainians residing in Poland is very likely to be exceeding 2 million Ukrainians as of December 2024. In the case of other nationalities, the real number of immigrants is definitely lower, not exceeding 1 million people.

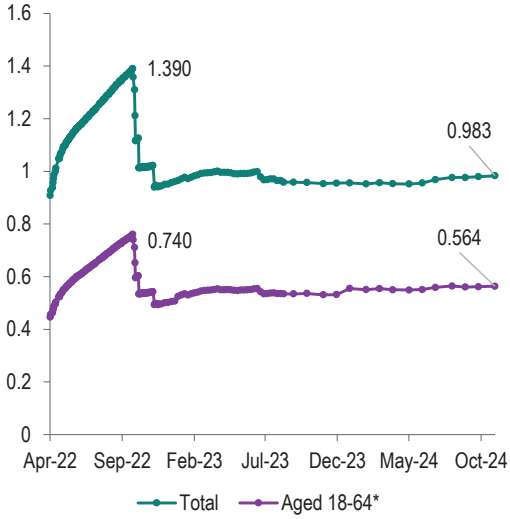
[7] Around 39% of the refugees were children, while around 4% were of age over 65. Moreover, in the period between 14 March 2022 and 9 November 2024 about 1.88 million applications for temporary protection status in Poland were submitted by refugees in total.
[8] Ukrainian citizens with biometric passports can enter all EU Member States under visa-free travel for a period of 90 days and further legalise their stay there.
[9] The results of a survey launched by Selectivv among Ukrainian mobile phone users indicate that the number of Ukrainian migrants could have reached almost 3.5 million in May 2022 and about 3.2 million in February 2023 (https://selectivv.com/ukraincy-w-polsce-dynamika-populacji [access: 10 December 2024]).

Figure 2. Monthly border crossings between Poland and Ukraine (in millions)



Source: Polish Border Guard data, own calculations.

Figure 3. Temporary protection status beneficiaries (UKR status in PESEL register, in millions)



Source: Polish Ministry of Digital Affairs data, own calculations.

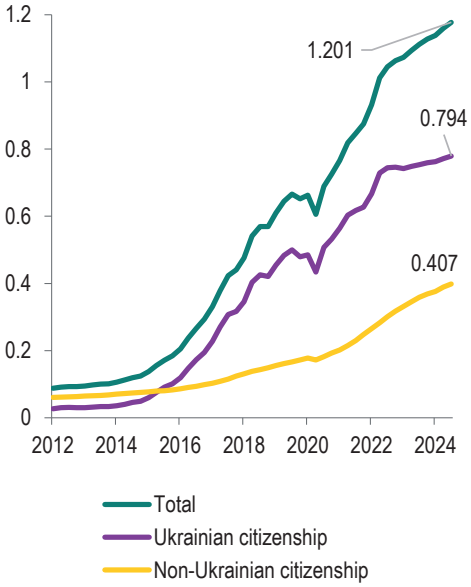
For the purpose of the current analysis we have followed the NBP estimation of the number of immigrants in the Polish labour market (**Figure 1**). Specifically, we have applied the same definition – average number of workers effectively accessible during the year.

As the main underlying source of information for our calculation, differentiating pre-war Ukrainian immigrants working in Poland from refugees, and from immigrants of other nationalities, we have used Social Security Institution (ZUS) data, which is considered relatively most accurate in reflecting the immigrants' contribution to total legal labour force. According to these data, as of the end of November 2024 there was a total of 1.201 million foreigners insured due to work in Poland. Although recently the continued growth in foreign labour supply has been recently mainly by other nationalities (0.407 million), Ukrainians continued to constitute over 2/3 of this number (0.794 million), of which about 250 thousand held the refugee status (**Figure 4**).

The estimates prepared by the Polish Ministry of Labour also appear to confirm the reliability of ZUS data. In particular, they indicate that the monthly number of Ukrainians holding a valid document legalizing their work in Poland oscillated between 700k and 800k in the years 2022-2024. Moreover, according to the Ministry of Labour data describing the number of citizens of Ukraine employed on the basis of notifications (as per end of June 2024), most Ukrainian refugees were employed in: manufacturing (about 28%), then in administrative and support service activities (19%), transportation and storage (18%), construction (8%), accommodation and catering (7%), as well as in retail and wholesale trade (7%). Compared to the structure of total employment in Poland (National Economy/Polish LFS data), the group of Ukrainians (both pre-war economic

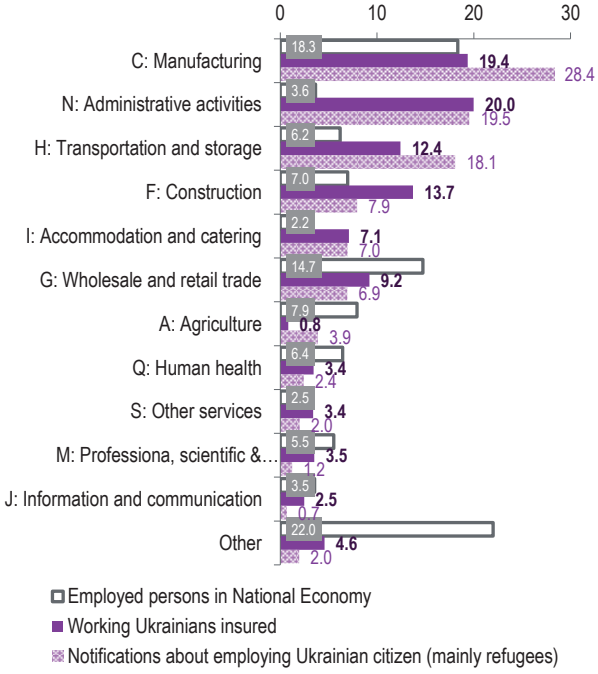
immigrants and refugees) was overrepresented especially in such NACE categories like transportation and storage, accommodation and catering, and administrative activities (**Figure 5**).

Figure 4. Foreigners covered by retirement and disability insurance in the Social Insurance Institution (in millions)



Source: Social Insurance Institution (ZUS) data, own calculations.

Figure 5. Structure of employment in Poland: domestic vs. Ukrainian workers by NACE (2024H1, in %)



Source: Statistics Poland, Social Insurance Institution (ZUS), Ministry of Family, Labour and Social Policy data, own calculations.

However, there is also a sizeable group of immigrants who stay outside of the official social security statistics. This group includes, among others, persons who perform economic activity in agriculture, persons under 27 in education exempted from paying social contributions due to mandate (civil law) contracts, as well as illegal workers. Using NBP survey data concerning the employment structure of immigrants from Ukraine, the share of illegal employment in this group has been estimated at about 1/3. Additionally the number of working young people exempted from social contributions has been estimated by using age and employment type structural data from Ministry of Labour statistics on registered notifications about employing a Ukrainian citizen (about one tenth). Moreover, we completed our calculation by taking into account also Ministry of Labour data on the number of seasonal work permits, reconciled with the information about Ukrainian agricultural support workers paying their social contributions to the

Polish Agricultural Social Insurance Fund (in total close to 1%)[10]. In the end, the base number of Ukrainians paying their social contributions to ZUS has been adjusted up by about 600k persons. Analogical but significantly weaker adjustment has been also applied to the case of immigrants of other nationalities, where, in the absence of direct survey measurement, conservatively a lower share of illegal employment was assumed.

With regard to the time dimension of the Ukrainian migration to Poland we have also remained consistent with the NBP approach[11]. Thus we have assumed that after the unprecedented wave of refugees has arrived from Ukraine because of the Russian military aggression in early 2022, the total number of Ukrainians in the Polish labour market stabilized at about 1.3 million in 2023 (**Figure 1**), of which 0.35-0.45 million persons were holding refugee status (UKR). In particular, changes observed in migration flows from Ukraine to Poland after 24 February 2022 have been determined by:

- an initial outflow of about 0.2 million pre-war male labour migrants willing to fight for their country after the Russian aggression, previously employed largely in transportation and construction;
- huge inflows of mostly female refugees, particularly intensive during the first 2-3 months of the war, who often undertook temporary non-qualified jobs in manufacturing, transportation or accommodation and catering;
- moderation of refugee inflows afterwards, accompanied, however, by their relatively high labour force participation, resulting in a slowly growing number of Ukrainians with refugee (UKR) status in the Polish labour market;
- systematically increasing importance of other countries of origin in the immigration structure in Poland.

3.4 The heterogeneity of workers and their workplaces

Accounting for the heterogeneity of native and immigrant workers across a variety of features, relevant for their productivity, requires detailed information on their wages, socio-demographic structure and the characteristics of their workplaces. In the case of native workers this information has been taken from Labour Force Survey data (LFS). In turn, to formulate our assumptions regarding the three considered categories of immigrant workers, we used unique survey data collected by Narodowy Bank Polski. These data come from large-scale surveys carried out among immigrants from Ukraine in Poland in the years 2019, 2022 and 2023[12].

[10] While the number of seasonal work permits for Ukrainian citizens issued during 2023 amounted to 13.7 thousand, the number of agricultural support workers paying their social contributions to the Polish Agricultural Social Insurance Fund remained on average lower than 5 thousand in 2023.

[11] *Inflation Report – November 2024*, NBP (https://nbp.pl/wp-content/uploads/2024/11/Raport-o-inflacji-listopad-2024-ANG.pdf [access: 10 December 2024]).

[12] For more information about the surveys see the reports published here: https://nbp.pl/publikacje/rozne-publikacje/publikacje-o-przeplywach-migracyjnych [access: 23 December 2024].

The use of information collected for three types of immigrants: (i) Ukrainians who came to Poland before the outbreak of full scale war in 2022, (ii) refugees from Ukraine (since 2022) and (iii) other immigrants (mostly from Belarus), allowed us to take into account the differences between different groups of immigrants in the Polish economy (**Table 1**). In addition, the time dimension of the survey dataset allowed us to capture the structure of immigrants at different moments in time, and thus better estimate the changes in their labour input across the years. It is particularly important in the case of immigrants because their situation in the labour market is more dynamic. Business cycles can have a more pronounced impact on them because their employment in the host country are usually less stable; many of them have entered the labour market only recently and are therefore likely to be temporarily working below their qualifications. On the other hand the changing structure of occupations and sectors where immigrants work can reflect the improvements in their labour market integration (larger percentages of employment in better paying occupations or sectors).

Table 1 presents some of the assumptions included in our calculations of the productivity-adjusted labour input. According to our estimates the total number of persons employed in 2023 in the Polish economy amounted to about 18,4 million. Of this number about 90,3% were Polish citizens, about 5,0% were immigrants from Ukraine who came to Poland before 2022 and remained in Poland in 2023, next 2,4% were Ukrainian refugees who came since the year 2022, and 2,3% were other immigrants. According to ZUS data this latter group was very heterogenous but consisted mainly of immigrants from Belarus as well as South and East Asia. Due to the lack of direct data representative for the "other immigrants" group, we decided to assign this group with the same structure as the structure of pre-war economic immigrants from Ukraine.[13]

The division of working immigrants from Ukraine into two groups: pre-war immigrants and refugees is justified by the clear difference between the demographic characteristics of both groups. The share of women is much higher among the refugees (nearly 75% in 2023) than among the pre-war immigrants (53%). There was also a relatively higher percentage of persons with tertiary education among refugees (45% compared to 41%). Refugees were less relatively frequently employed in industry (19% vs. 33%), but more frequently in services (71% vs. 57%).

The most important difference between both groups of immigrants and the native workers is the structure of their occupations, though. More than 30% of native workers were employed in the top occupations (managers or specialists). Among immigrants this percentage amounted to 11-13% only. Accordingly, the most frequent occupations of pre-war immigrants (53% in 2023) and especially refugees (68%) were bottom level occupations (simple works, manual workers, work in personal services). Given the large share of tertiary educated Ukrainians in the Polish labour force, this is suggestive of a substantial share of immigrants working below their qualifications.

[13] New data from an NBP survey carried out in 2024 among immigrants from Belarus can potentially shed more light on the structure of Belarussian immigrants in Poland, potentially allowing us to improve our paper in this respect in the future.

Table 1. The structure of native and immigrant works by selected features

	Native Polish workers			Ukrainian pre-war immigrants		Ukrainian refugees		Other immigrants
	in 2010	in 2019	in 2023	in 2019	in 2023	in 2022	in 2023	in 2023
number of workers (LFS and own estimates)	15451	16359	16623	1001	918	350	450	415
Percentages in the groups								
women	44.8%	45.0%	45.8%	48.6%	53.2%	78.4%	74.6%	53.2%
persons with tertiary education	26.7%	36.6%	40.6%	37.0%	41.2%	55.2%	45.3%	41.2%
persons in prime-age (25-44)	66.1%	65.7%	65.5%	71.9%	51.8%	52.9%	51.0%	51.8%
Sectors								
agriculture and construction	20.6%	16.7%	16.9%	25.5%	9.5%	11.0%	9.6%	9.5%
industry	23.4%	24.3%	22.7%	34.5%	33.5%	21.2%	18.9%	33.5%
services	56.1%	59.1%	60.4%	40.0%	56.9%	67.8%	71.5%	56.9%
Occupations								
high skilled occupations	23.8%	28.1%	30.6%	13.8%	11.7%	13.0%	10.8%	11.7%
middle skilled occupations	44.6%	44.9%	44.3%	15.7%	35.2%	18.9%	20.7%	35.2%
low skilled occupations	31.6%	27.0%	25.1%	70.5%	53.2%	68.1%	68.4%	53.2%
average weekly hours worked	39.4	37.8	38.5	48.8	48.4	50.8	48.1	48.4

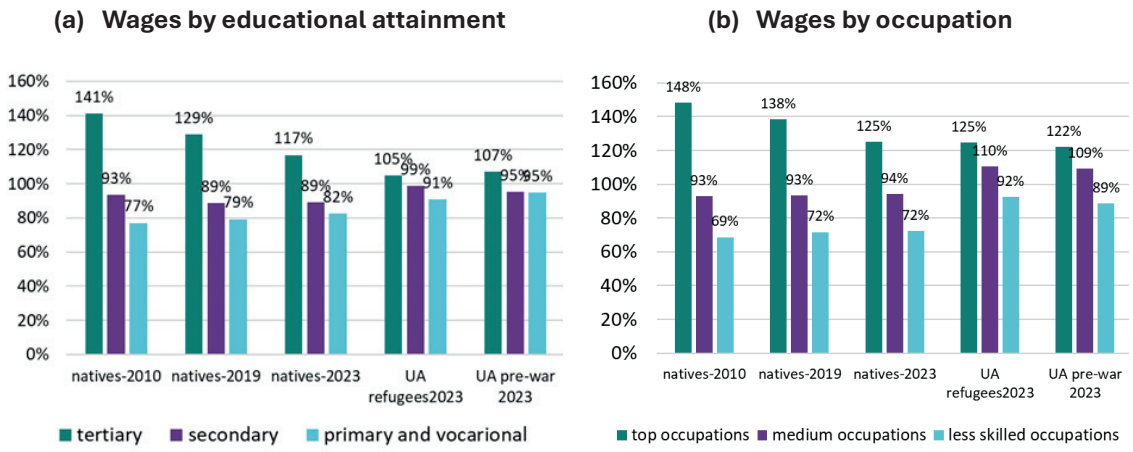
Source: NBP.

Another component of the total labour input are the average hours worked by each group of employees. The survey data shows that all main groups of immigrants worked significantly longer hours (between 48.4-50.8 hours per week in 2019-23) than the native workers (38.5 hours in 2023).

In this paper the productivity of workers is measured indirectly by their wages. The decomposition takes into account both the changing structure of workers across groups, defined as combinations of the five considered features (education, occupation, sector, age and gender), and the changes in wages earned by persons in each group over time. Although it is not possible to present the differences in wages across all groups in detail, one may present the most important relationships at the aggregate level.

Namely, we find that the two most important predictors of wages are educational attainment and occupation category. In the case of educational attainment (**Figure 6a**), a wage premium for tertiary education is observed in all groups. However, it is larger among the native workers and shows a tendency to decline with time. In the case of immigrants, the premium for formal education was very small throughout. In turn, occupation (**Figure 6b**) diversifies wages of native persons in a similar way as educational attainment, but it seems to be more universal – it also strongly diversifies the wages of immigrant workers.

Figure 6. Wages by education attainment and occupation, as a percentage of the average wage. Comparison of natives and immigrants



Source: NBP surveys among immigrants from Ukraine.

4. The contribution of immigrants and refugees to the labour input

We are now in the position to decompose the dynamics of the total labour input into changes along the extensive margin (total employment), the intensive margin (average hours worked per worker), and changes in the structure of workers ("quality" of labour force).

4.1 Results of the baseline decomposition

Although we analyse employment dynamics across the entire period 1995-2023, we only find nonzero contributions of immigrant workers after 2006. This is because immigration to Poland was negligible until 2005 and a significant increase in the number of immigrant workers was observed only after 2014 (**Figure 7**). We find a similar pattern across most of the analysed years since 2014: the positive contribution of immigrant workers to total employment was accompanied by a positive contribution of average hours worked per person (because the immigrants tend to work longer hours than natives). However, the total impact was diminished by the "quality" factor, mirroring the lower average productivity of immigrants compared to their native peers. On balance, the lower average productivity of immigrants was almost exactly compensated by their longer working hours.

After 2014 the increasing number of immigrant workers began to produce sizeable contributions to annual changes in employment and the labour input in Poland (**Figure 7** and **Table 2**). At the same time, owing to (i) a shrinking number of working-age persons and (ii) declining average hours worked, annual increases in the labour input of natives were relatively limited. Hence, one could say that since 2014, increasing employment of foreign workers has been helping mitigate the negative effects of the two aforementioned employment headwinds.

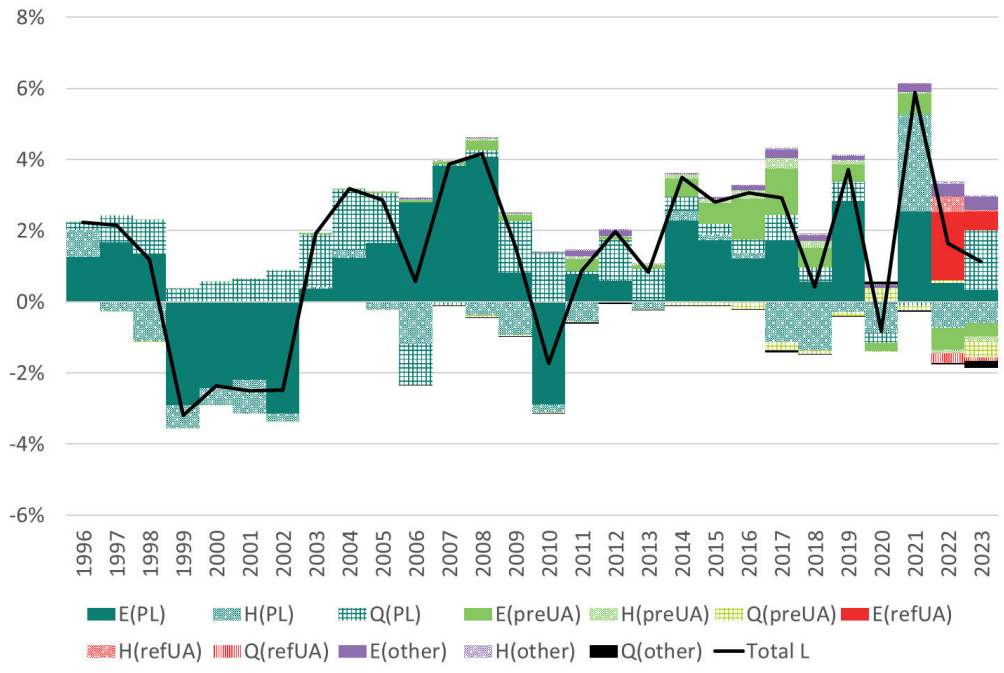
We find that in 2013-2021 the average growth rate of the total labour input amounted to 2.6% per annum, fluctuating between -1% in the pandemic year 2020 and almost 6% during the sharp recovery in 2021. Thanks to increasing labour market participation and growing labour productivity, the native workers contributed 1.8 pp. to that growth (69% of total). In turn, the inflow of immigrants from Ukraine contributed 0.7 pp. (25% of total), and other immigrants added 0.1 pp. (5%). In 2020 the COVID-19 lockdowns caused a significant reduction of labour input among the native workers (-1.2%) due to a reduction in average hours worked and a decline in the labour "quality" component[14], but the reduction in employment was relatively small (-0.1%). Among immigrant workers, a small reduction in employment (-0,2%) was accompanied by an increase in labour "quality", so that their overall labour supply slightly picked up (+0,1%). In 2021 there was a major rebound in employment and the number of hours worked, and positive contributions of immigrant workers resumed accordingly (it also included

[14] COVID-19 lockdowns influenced the working hours of more productive workers (e.g., managers and specialists) relatively more strongly than those of, e.g., manual workers in industry or agriculture. At the same time, international migration flows were strongly limited.

increased migration from Belarus after the repressions on opposition began there in 2020).

The period 2022-2023 saw a major shift in labour supply and employment because of the appearance of war refugees from Ukraine on the Polish labour market. Although in the same year, some of the pre-war immigrants from Ukraine (mostly males) returned to Ukraine to join the Ukrainian army, the net impact of these changes was positive in terms of employment (1.3 pp. of the total increase in 2022 and 0.1 pp. in 2023) and total labour input (1.5 pp. in 2022 and -0.4 pp. in 2023). At the same time the inflow of immigrants from other countries also became more visible, but their total impact was lower because of their relatively lower productivity. Altogether (**Table 3**), in 2021-23 Ukrainian workers contributed 0.5 pp. (37%) to the total 1.4% average annual increase in the labour input, whereas other immigrants added 0.3 pp. (22%).

Figure 7. The decomposition of changes in the total labour input across the four categories of workers, factoring in changes in employment, average hours worked and the "quality" factor



Source: own calculations.

Note: PL – Polish workers, preUA – pre-war immigrants from Ukraine, refUA – Ukrainian refugees, other – other immigrants. E – employment, H – average hours worked, Q – the "quality" factor.

Table 2. The contributions of immigrant and native workers to total employment and the total labour input

	Employment					Labour input (L)				
	Polish workers	Pre-war immigrants	Refugees	Other immigrants	Total	Polish workers	Pre-war immigrants	Refugees	Other immigrants	Total
2010	-2.9	0.0	0.0	0.0	-2.9	-1.7	0.0	0.0	0.0	-1.7
2011	0.8	0.3	0.0	0.2	1.3	0.3	0.4	0.0	0.2	0.9
2012	0.6	0.1	0.0	0.2	0.8	1.7	0.1	0.0	0.2	2.0
2013	0.1	0.1	0.0	0.0	0.2	0.7	0.1	0.0	0.0	0.8
2014	2.3	0.5	0.0	0.0	2.8	2.9	0.5	0.0	0.0	3.4
2015	1.7	0.6	0.0	0.0	2.3	2.2	0.6	0.0	0.0	2.8
2016	1.2	1.1	0.0	0.1	2.5	1.7	1.2	0.0	0.1	3.0
2017	1.7	1.3	0.0	0.2	3.2	1.3	1.3	0.0	0.2	2.9
2018	0.6	0.6	0.0	0.2	1.3	-0.4	0.6	0.0	0.2	0.4
2019	2.8	0.5	0.0	0.1	3.4	3.0	0.5	0.0	0.1	3.6
2020	-0.1	-0.2	0.0	0.1	-0.2	-1.2	0.1	0.0	0.2	-0.8
2021	2.5	0.6	0.0	0.2	3.3	5.0	0.5	0.0	0.2	5.7
2022	0.5	-0.6	1.9	0.3	2.1	-0.2	-0.6	2.1	0.4	1.6
2023	0.3	-0.4	0.5	0.4	0.9	1.4	-0.9	0.5	0.2	1.1

Source: own calculations.

Table 3. The contributions of immigrant and native workers to total employment and the total labour input – cumulative values

	Employment					Labour input				
	Polish workers	Pre-war immigrants	Refugees	Other immigrants	Total	Polish workers	Pre-war immigrants	Refugees	Other immigrants	Total
1996*-2023	0.7	0.2	0.1	0.1	1.1	1.0	0.2	0.1	0.1	1.3
1996*-2005	-0.5	0.0	0.0	0.0	-0.5	0.0	0.0	0.0	0.0	0.1
2005*-2013	1.2	0.1	0.0	0.1	1.4	1.3	0.1	0.0	0.1	1.5
2013*-2021	1.6	0.6	0.0	0.1	2.3	1.8	0.7	0.0	0.1	2.6
2021*-2023	0.4	-0.5	1.2	0.4	1.5	0.6	-0.8	1.3	0.3	1.4

*base year.

Source: own computations.

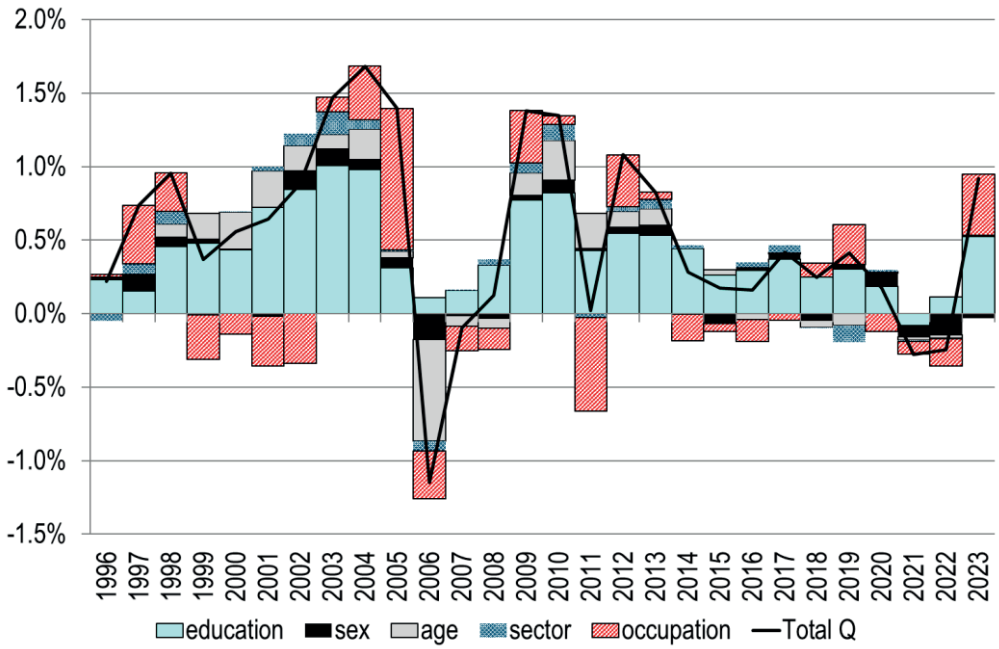
4.2 The role of changes in the structure of native and immigrant labour input

Although the dynamics of total labour input were to driven mostly by changes in employment, the changing structure of employment also played a role. The changing structure of the labour force and workplaces had an overall positive impact on labour productivity in the economy in the period 1995-2023 (**Figure 8**). However, changes in productivity due to the changing structure of employment were countercyclical: upturns in the business cycle led to proportionally larger employment of less productive

persons, while downturns caused more intense selection of more productive persons who remained employed. We also find that in the last decade the gains from shifts to a more productive employment structure were relatively smaller than in previous years, dominated by the transition and restructuring of the Polish economy (1990s), and the education boom (mostly 2000s).

In line with previous analysis, it is confirmed that the improving educational attainment was the major feature behind the observed gains in labour productivity. However, in the years with significant unemployment reductions, a negative impact of occupational structure on productivity was observed. It was visible, in particular, throughout most of the last decade, raising the question to what extent those changes were related to the native labour force, and to what extent they reflected the appearance of immigrant workers on the Polish labour market.

Figure 8. The contribution of different features of employed persons to total annual change in the "quality" component of the labour input – all workers, 1995-2023

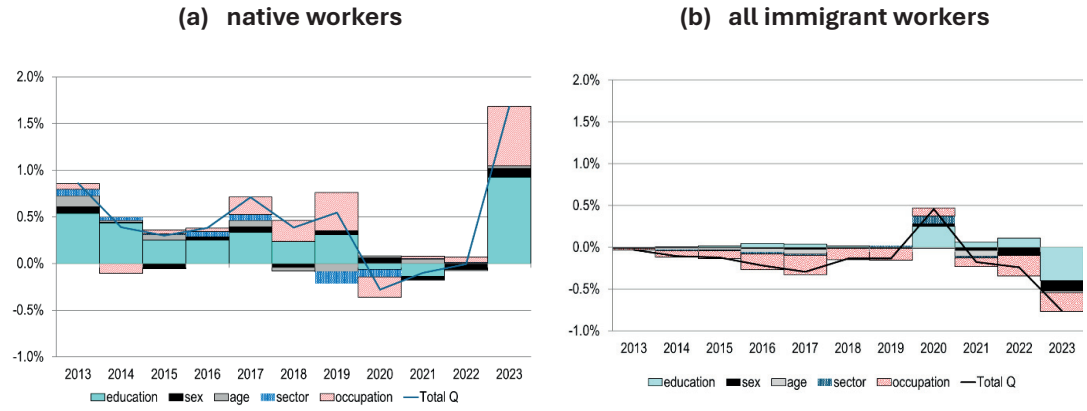


Source: own computations.

The changes in the structure of native workers since 2013 had a larger impact on the total labour input than that of immigrant workers due to the much larger total population of employed natives (**Figure 9**). In the case of native workers the contribution of their structure to the total labour input was positive with the exception of years 2020-2022, reflecting mainly the increasing number of workers with tertiary education. In addition, the contribution of the shift from less to more productive occupations also frequently had a positive impact on the labour input of Polish workers. In contrast, immigrants were

employed far more frequently in less productive occupations than natives, so their increasing employment in the economy was accompanied with negative productivity contributions. In 2023 we also observed a decrease in the share of the Ukrainian immigrants with tertiary education employed in the Polish economy that resulted in a negative impact of this category. However, in general the educational attainment of immigrants had a relatively small impact because of the small average impact of formal education of immigrants on their wages in Poland.

Figure 9. Factors behind changes in the "quality" component among native and immigrant workers, 2013-2023



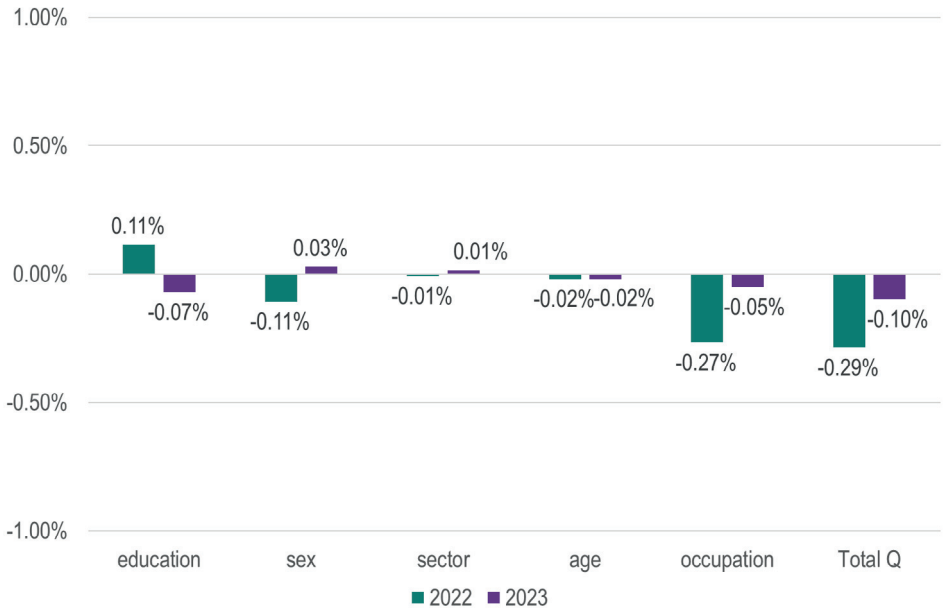
Source: own calculations.

Our decomposition framework allows also to zoom in on the specific features responsible for changes in the labour "quality" component in each respective group of immigrant workers. **Figure 10** presents, as an example, the contribution of refugees from Ukraine who came to Poland in 2022 and 2023. Refugees were a major contributor to the change in total employment in Poland in 2022 (1.9 pp.) and 2023 (0.5 pp.), and even more so to total hours worked (2.4 pp. in 2022, 0.6 pp. in 2023). However, they were relatively disadvantaged on the labour market due to the circumstances of their migration to Poland. That explains why the "quality" component reduced their contribution to the total labour input by 0.3 pp. in 2022 and by 0.1 pp. in 2023.

The measurement of refugees' labour productivity over time can give a hint about their economic integration. The main observation here is that their lower productivity in the Polish economy was primarily due to finding jobs in less productive (mostly bottom-level) occupations. This was especially visible in 2022 (-0.3 pp.), but became much less pronounced in 2023 because of relatively lower additional employment and the refugees' ability to gradually shift to better paid and more productive occupations (Strzelecki, 2024). We also account for the initial inflow of relatively highly educated and predominantly female refugees in 2022 – education contributed +0.1 pp., whereas the female share contributed -0.1 pp. With time, though, due to a decreasing share of

refugees with tertiary education remaining in Poland in 2023, the contribution of education turned negative (-0.1 pp.).

Figure 10. Features behind changes in the "quality" component among refugee workers in Poland in 2022-2023



Source: own calculations.

5. The contribution of immigrants and refugees to economic growth

When plugged into the growth accounting framework, our estimates of immigrants' labour supply lead to the following results (**Table 4**, **Figure 11**).

First of all, over the entire time frame 1996-2023 the top contributor to GDP growth was physical capital accumulation. This factor alone was responsible for about 43% of total GDP growth (1.6 pp. per annum on average), and its contributions were very consistent across the decades, relatively little affected even by the major shocks as the Global Financial Crisis or the COVID-19 pandemic. The second largest contributor was (capacity utilisation-adjusted) TFP growth, adding another 34% of total GDP growth (1.3 pp. per annum on average). However, we see a systematic downward tendency in the importance of this factor for Poland's growth over the years: while in 1996-2005, it accounted for as much as 57% of total GDP growth, in the recent years its prominence has markedly dwindled; in 2013-21, only 14% of growth was attributed to TFP growth. This suggests that the potential of economic forces behind TFP growth, such as the adoption of Western technologies or reductions in technical inefficiency, which have been of great help at the initial stages of Poland's economic convergence, may have been largely exhausted by now, and the country's continued convergence in the future may require a shift to a different growth model, for example one with a greater focus on domestic innovation.

Second, Poland's GDP growth was also increasingly driven by growth in effective labour supply. Over the entire period 1996-2023, labour supply growth was responsible for 22% of all GDP growth (0.8 pp. per annum on average), with its share rising to as much as 43% of GDP growth (1.7 pp. per annum) in 2013-21 and 31% of GDP growth (0.8 pp. per annum) in 2021-23. Further subdividing overall labour supply growth into the growth in total hours worked and improvements in labour composition (**Table 7** in the Appendix), we find that the former was generally much more important than the latter. The only exception was the early period 1996-2005 when hours worked rapidly declined, contributing to -0.4 pp. per annum to GDP growth on average, a tendency which was almost exactly counterbalanced by the concurrent growth in labour productivity thanks to the ongoing education boom, so that the labour composition component contributed +0.4 pp. per annum to GDP growth. In that period, though, unemployment rates were exceptionally high in Poland, particularly after the Russian crisis (2000-03). Furthermore, immediately after Poland joined the EU in May 2004, there was also a major emigration wave of young Poles to (mostly) UK and Ireland, further reducing total hours worked in the Polish economy.

Table 4. The decomposition of GDP growth, including the contributions of four types of workers.

Contributions (pp.)

	GDP (yoy)	Capital input	Utilisation	A (adjusted TFP)	Labour input				
					Polish workers	Pre-war immigrants	Refugees	Other immigrants	Total
1996*-2023	3.7	1.6	0.0	1.3	0.6	0.1	0.1	0.1	0.8
1996*-2005	3.9	1.6	0.0	2.2	0.0	0.0	0.0	0.0	0.0
2005*-2013	3.7	1.7	0.0	1.1	0.8	0.1	0.0	0.0	0.9
2013*-2021	3.8	1.5	0.1	0.6	1.1	0.4	0.0	0.1	1.7
2021*-2023	2.6	1.4	-0.2	0.6	0.4	-0.5	0.8	0.2	0.8

Cumulative contributions (pp.)

	GDP (yoy)	Capital input	Utilisation	A (adjusted TFP)	Labour input				
					Polish workers	Pre-war immigrants	Refugees	Other immigrants	Total
1996*-2023	100.7	43.0	1.0	34.3	16.3	3.2	1.5	1.4	22.4
1996*-2005	34.8	14.5	0.4	19.9	-0.1	0.1	0.0	0.0	0.0
2005*-2013	29.9	13.8	-0.2	8.8	6.5	0.7	0.0	0.3	7.5
2013*-2021	30.8	11.9	1.2	4.4	9.2	3.4	0.0	0.7	13.3
2021*-2023	5.3	2.8	-0.4	1.2	0.7	-1.0	1.5	0.4	1.7

Percentages of total GDP growth

	GDP (yoy)	Capital input	Utilisation	A (adjusted TFP)	Labour input				
					Polish workers	Pre-war immigrants	Refugees	Other immigrants	Total
1996*-2023	100%	43%	1%	34%	16%	3%	2%	1%	22%
1996*-2005	100%	42%	1%	57%	0%	0%	0%	0%	0%
2005*-2013	100%	46%	-1%	29%	22%	2%	0%	1%	25%
2013*-2021	100%	39%	4%	14%	30%	11%	0%	2%	43%
2021*-2023	100%	53%	-7%	23%	14%	-18%	29%	7%	31%

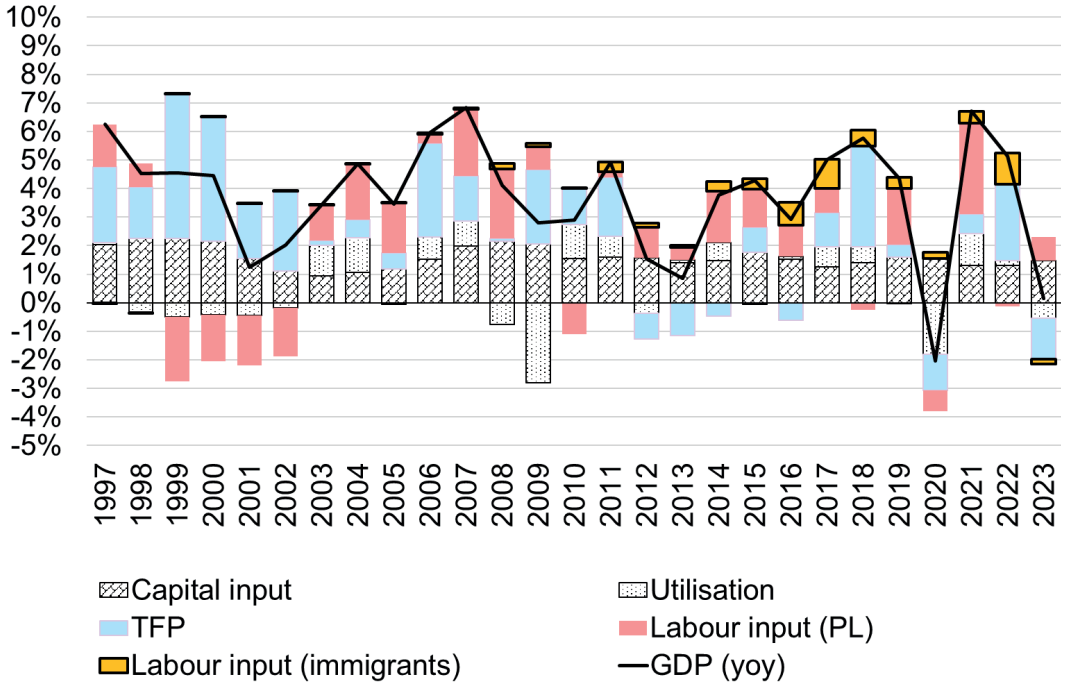
*base year

Source: own calculations.

Third, the contribution of immigrants within the labour supply component was systematically rising over time. First noticeable migration inflows to Poland were observed in 2006; then a major wave of Ukrainian immigration occurred from 2014 onwards. After the Russian full-scale military invasion of Ukraine in 2022, the arriving

Ukrainian refugees further expanded the labour supply in the Polish economy, while a significant, but relatively much smaller, fraction of pre-war immigrants returned to Ukraine. In effect, we see that the contribution of immigrants' labour to Poland's GDP growth increased from 3% (0.1 pp. per annum) in 2005-13, through 13% (0.5 pp. per annum) in 2013-21[15], to 18% (0.5 pp. per annum) in 2021-23. Specifically the labour supply of Ukrainian refugees accounted for 29% of Poland's GDP growth in 2021-23 (0.8 pp. per annum on average). On top of that, GDP growth was also supported by the inflows of immigrants from other countries, such as Belarus or the countries of South Asia. Their contribution also gradually rose over time, amounting to 2% of total GDP growth (0.1 pp. on average) in 2013-21 and 7% (0.2 pp. on average) in 2021-23.

Figure 11. The decomposition of economic growth in Poland, with emphasis on the labour input of native workers and immigrants.



Source: own calculations.

[15] This number almost exactly coincides with Strzelecki et al.'s (2022) estimates for the period 2014-18.

6. Discussion and concluding remarks

The aim of this paper has been to estimate the contribution of Ukrainian refugees and other immigrants to the labour force and economic growth in Poland. We have achieved this goal by the means of a detailed growth accounting exercise, differentiating between Ukrainian refugees, economic (pre-war) immigrants from Ukraine and immigrants from other source countries. Using a unique dataset compiled at NBP, based on face-to-face surveys carried out among the Ukrainian immigrants and refugees in Poland, we were able to carefully account for the different socio-economic and demographic characteristics of these three distinct immigrant groups.

Our findings have three broad implications. First, ever since Poland has switched its status from an emigration to an immigration country in 2014, immigrants – mostly from Ukraine – have been contributing significantly to Poland's output and helped its economy converge towards Western Europe. At the same time, the contributions of TFP have been declining, indicating that progress in technology adoption and inefficiency reduction may have decelerated and suggesting possible troubles for Poland's convergence prospects in the future.

Second, in the future, were the immigrants to stay in Poland for the long term, then given the fact that they tend to be younger on average than the native Polish population, they may help at least partly alleviate the problem of Poland's quickly aging workforce. However, in the long run this potential is limited given that fertility rates among Ukrainians or Belarussians are even lower than among the native Poles.

Third, our results underscore that Ukrainian refugees were quick to seek and find employment in Poland. While in 2022, they were working largely in simple occupations below their qualifications, already within one year most of them learned the native language and moved on to better suiting (and better paying) jobs. By the end of 2023, about 40% of refugees were employed, despite the fact that many of them were women with children. Although very encouraging, our results are however not representative for other refugee populations. Historically, as documented e.g. by OECD (2022) or FRA (2023), refugees tended to be relatively less educated and less willing or able to find good jobs. Their integration into the labour market of the host country was also frequently hampered by host countries' less accommodating policies as well as greater cultural differences.

In the future, additional research could focus on aspects of refugee integration which have been omitted in the current study, such as skill mismatches or entrepreneurship. At the macro level, an open question to be studied relates to the links between immigration and technology adoption. It may be hypothesized that the abundance of cheap labour supply could have incentivized firms to postpone their investments in technological upgrading or automation. In other words, our result of a negative correlation between immigrants' contributions and TFP contributions to GDP growth could have actually been endogenous. However, studying this requires moving beyond the growth accounting framework.

References

Battisti, M., Peri, G., & Romiti, A. (2022). Dynamic effects of co-ethnic networks on immigrants' economic success. *The Economic Journal*, 132(641), 58-88.

Bell, V., Burriel-Llombart, P., & Jones, J. (2005). A quality-adjusted labour input series for the United Kingdom (1975–2002). Working Paper No. 280, Bank of England.

Caselli, F., Lin, H., Toscani F. & Yao, J. (2024), Migration into the EU: Stocktaking of Recent Developments and Macroeconomic Implications. IMF Working Paper 2024/211.

Chmielewska-Kalińska, I., Dudek, B. & Strzelecki, P. (2023). Sytuacja życiowa i ekonomiczna migrantów z Ukrainy w Polsce – wpływ pandemii i wojny na charakter migracji w Polsce. Raport z badania ankietowego. NBP, Warszawa.

Chrostowska, P. (2023). *Uczniowie uchodźczy z Ukrainy w polskim systemie edukacji*. Centrum Edukacji Obywatelskiej.

Deloitte (2024), *Analysis of the impact of refugees from Ukraine on the economy of Poland*. Deloitte Poland.

Duszczyk, M., Górny, A., Kaczmarczyk, P., & Kubisiak, A. (2023). War refugees from Ukraine in Poland–one year after the Russian aggression. Socioeconomic consequences and challenges. *Regional Science Policy & Practice*, 15(1), 181-200.

Fasani, F., Frattini, T., & Minale, L. (2021). Lift the ban? Initial employment restrictions and refugee labour market outcomes. *Journal of the European Economic Association,* 19(5), 2803-2854.

Fasani, F., Frattini, T., & Minale, L. (2022). (The Struggle for) Refugee integration into the labour market: evidence from Europe. *Journal of Economic Geography,* 22(2), 351-393.

Fernald, J. (2012a). A quarterly, utilization-adjusted series on total factor productivity. Working Paper 2012-19, Federal Reserve Bank of San Francisco.

Fernald, J. (2012b). Productivity and potential output before, during, and after the great recession. Working Paper 2012-18, Federal Reserve Bank of San Francisco.

FRA (2023). *Fleeing Ukraine: Displaced people's experiences in the EU.* European Union Agency for Fundamental Rights.

Górny, A. & Kaczmarczyk, P. (2023), Between Ukraine and Poland. Ukrainian migrants in Poland during the war. *CMR Spotlight*, 2(48).

Górny, A., van der Zwan, R. (2024), Mobility and labor market trajectories of Ukrainian migrants to Poland in the context of the 2014 Russian invasion of Ukraine, *European Societies,* 26 (2), 438-468

Gradzewicz, M., Growiec, J., Kolasa, M., Postek, Ł, & Strzelecki, P. (2018), Poland's uninterrupted growth performance: New growth accounting evidence, *Post-Communist Economies* 30, 238–272.

Gromadzki, J. & Lewandowski, P. (2022). Refugees from Ukraine on the Polish labour market, *Ubezpieczenia Społeczne. Teoria i praktyka* 4/2022, 29-40.

Hagemejer, J. & Kulesa, A. (2024), *Kierunek Polska: Rekomendacje dla polskiej polityki imigracyjnej. Znaczenie imigracji dla rozwoju gospodarczego Polski*. Centrum Analiz Społeczno-Ekonomicznych i Forum Obywatelskiego Rozwoju.

Honorati, M., Testaverde, M. & Totino E. (2024), Labor market integration of refugees in Germany: new lessons after the Ukrainian crisis. Social Protection and Jobs Discussion Paper No. 2404. World Bank.

Kosyakova, Y., Gatskova, K., Koch, T., Adunts, D., Braunfels, J., Goßner, L., Konle-Seidl, R., Schwanhäuser, S. & Vandenhirtz, M. (2024), Labour market integration of Ukrainian refugees: An international perspective. IAB-Forschungsbericht 16/2024 (en).

NBP (2024), *NBP Quick Monitoring Survey. Economic climate in the enterprise sector*. No. 4/2024 (October 2024). Narodowy Bank Polski, Warszawa.

OECD (2022). *The potential contribution of Ukrainian refugees to the labour force in European host countries*. OECD, Paris.

Saczuk, K. (2014). Badanie aktywności ekonomicznej ludności w Polsce w latach 1995-2010: korekta danych. *Materiały i Studia NBP*, No. 301. Narodowy Bank Polski.

Saczuk, K., Zajkowska, O. (2024). Measuring labour force participation during pandemics and methodological changes, *NBP Working Papers* (No. 372). Narodowy Bank Polski.

Strzelecki, P. (2024), The unexplained wage gap between native workers and Ukrainian immigrants in Poland - evolution between 2015-2023. Conference paper, PAA Applied Demographic Conference 2024.

Strzelecki, P., Growiec, J., & Wyszyński, R. (2022), The contribution of immigration from Ukraine to economic growth in Poland, *Review of World Economics* 158(2), 365-399.

ZUS (2024a), Cudzoziemcy w polskim systemie ubezpieczeń społecznych 2023, Zakład Ubezpieczeń Społecznych, Warszawa, https://www.zus.pl/baza-wiedzy/statystyka/opracowania-tematyczne/cudzoziemcy [dostęp: 2025.03.16].

ZUS (2024b), Ważniejsze informacje z zakresu ubezpieczeń społecznych 2023, Zakład Ubezpieczeń Społecznych, Warszawa, https://www.zus.pl/baza-wiedzy/statystyka/wazniejsze-informacje-z-zakresu-ubezpieczen-spolecznych-fundusz-ubezpieczen-spolecznych [dostęp: 2025.03.16].

Appendix

Data sources on immigrants

Table 5. Detailed list of data sources on immigration.

Name	Source	Information type	Dissemination
Border crossings between Poland and Ukraine	Polish Border Guard	persons	daily/monthly
Foreigners covered by retirement and disability insurance	The Social Insurance Institution	persons	monthly
Polish ID number (PESEL) register	The Chancellery of the Prime Minister	persons	monthly
Registered applications for Polish ID number (PESEL)	The Chancellery of the Prime Minister	applications	monthly
Foreigners performing work in Poland (experimental statistics)	Statistics Poland	persons	monthly
Visas	Ministry of Foreign Affairs	persons	yearly
Documents legalising work (work permits, seasonal work permits, notifications)	Ministry of Family, Labour and Social Policy	documents	quarterly
Permanent and temporary residence and work permits	Office for Foreigners	documents	daily
First residence permits	Eurostat	documents	yearly
Users of mobile devices residing in Poland	Selectivv	mobile devices	irregular
Surveys on migrants	NBP, UNHCR, etc.	persons	irregular

Source: own elaboration.

Year-on-year growth accounting results

Table 6. The decomposition of annual GDP growth, including different types of workers.

					Labour input				
	GDP (yoy)	Capital input	Utilisation	A (adjusted TFP)	Polish workers	Pre-war immigrants	Refugees	Other immigrants	Total
1997	6.2	2.0	0.1	2.6	1.5	0.0	0.0	0.0	1.5
1998	4.5	2.2	-0.3	1.8	0.8	0.0	0.0	0.0	0.8
1999	4.5	2.3	-0.5	5.0	-2.3	0.0	0.0	0.0	-2.3
2000	4.5	2.2	-0.4	4.4	-1.6	0.0	0.0	0.0	-1.6
2001	1.3	1.5	-0.4	1.9	-1.8	0.0	0.0	0.0	-1.8
2002	2.0	1.1	-0.2	2.8	-1.7	0.0	0.0	0.0	-1.7
2003	3.4	0.9	1.1	0.2	1.2	0.0	0.0	0.0	1.3
2004	4.9	1.1	1.2	0.6	1.9	0.0	0.0	0.0	2.0
2005	3.4	1.2	-0.1	0.6	1.7	0.0	0.0	0.0	1.8
2006	6.0	1.5	0.8	3.3	0.3	0.0	0.0	0.0	0.4
2007	6.8	2.0	0.9	1.6	2.3	0.0	0.0	0.0	2.4
2008	4.1	2.2	-0.8	0.1	2.4	0.2	0.0	0.0	2.6
2009	2.8	2.1	-2.8	2.6	0.8	0.1	0.0	0.0	0.9
2010	2.9	1.6	1.2	1.3	-1.1	0.0	0.0	0.0	-1.1
2011	4.9	1.6	0.7	2.1	0.2	0.2	0.0	0.1	0.5
2012	1.5	1.6	-0.4	-0.9	1.1	0.0	0.0	0.1	1.2
2013	0.9	1.4	0.1	-1.2	0.4	0.1	0.0	0.0	0.5
2014	3.8	1.5	0.6	-0.5	1.8	0.3	0.0	0.0	2.1
2015	4.3	1.8	-0.1	0.9	1.3	0.4	0.0	0.0	1.7
2016	2.9	1.5	0.1	-0.6	1.1	0.7	0.0	0.1	1.9
2017	5.0	1.3	0.7	1.2	0.8	0.9	0.0	0.2	1.9
2018	5.8	1.4	0.6	3.5	-0.3	0.4	0.0	0.1	0.3
2019	4.4	1.6	0.0	0.4	2.0	0.3	0.0	0.1	2.3
2020	-2.0	1.6	-1.8	-1.3	-0.7	0.1	0.0	0.1	-0.5
2021	6.7	1.3	1.1	0.7	3.2	0.3	0.0	0.1	3.6
2022	5.1	1.3	0.2	2.7	-0.1	-0.4	1.2	0.2	1.0
2023	0.2	1.5	-0.5	-1.4	0.8	-0.6	0.3	0.1	0.7

Source: own calculations.

Detailed growth accounting results

Table 7. The decomposition of GDP growth, including the "quality vs. quantity" labour decomposition.

Contributions (pp.)

	GDP (yoy)	Capital (volume)	Capital (structure)	Utilisation	A (adjusted TFP)	Labour input								
						Polish workers (hours)	Polish workers (structure)	Pre-war immigrants (hours)	Pre-war immigrants (structure)	Refugees (hours)	Refugees (structure)	Other immigrants (hours)	Other immigrants (structure)	Total
1996*-2023	3.7	1.5	0.1	0.0	1.3	0.4	0.2	0.1	0.0	0.1	0.0	0.1	0.0	0.8
1996*-2005	3.9	1.4	0.2	0.0	2.2	-0.4	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2005*-2013	3.7	1.7	0.0	0.0	1.1	0.8	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.9
2013*-2021	3.8	1.5	0.0	0.1	0.6	1.0	0.1	0.4	0.0	0.0	0.0	0.1	0.0	1.7
2021*-2023	2.6	1.4	0.0	-0.2	0.6	0.3	0.1	-0.3	-0.2	0.7	0.0	0.2	0.0	0.8

Cumulative contributions (pp.)

	GDP (yoy)	Capital (volume)	Capital (structure)	Utilisation	A (adjusted TFP)	Labour input								
						Polish workers (hours)	Polish workers (structure)	Pre-war immigrants (hours)	Pre-war immigrants (structure)	Refugees (hours)	Refugees (structure)	Other immigrants (hours)	Other immigrants (structure)	Total
1996*-2023	100.7	41.0	2.1	1.0	34.3	11.4	4.9	3.3	-0.1	1.5	0.1	1.4	0.0	22.4
1996*-2005	34.8	12.8	1.7	0.4	19.9	-3.3	3.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0
2005*-2013	29.9	13.7	0.1	-0.2	8.8	6.2	0.3	0.7	0.0	0.0	0.0	0.3	0.0	7.5
2013*-2021	30.8	11.7	0.2	1.2	4.4	8.0	1.2	3.1	0.3	0.0	0.0	0.7	0.1	13.3
2021*-2023	5.3	2.8	0.0	-0.4	1.2	0.5	0.2	-0.6	-0.4	1.5	0.1	0.4	-0.1	1.7

Percentages of total GDP growth

	GDP (yoy)	Capital (volume)	Capital (structure)	Utilisation	A (adjusted TFP)	Labour input								
						Polish workers (hours)	Polish workers (structure)	Pre-war immigrants (hours)	Pre-war immigrants (structure)	Refugees (hours)	Refugees (structure)	Other immigrants (hours)	Other immigrants (structure)	Total
1996*-2023	100%	41%	2%	1%	34%	11%	5%	3%	0%	1%	0%	1%	0%	22%
1996*-2005	100%	37%	5%	1%	57%	-10%	9%	0%	0%	0%	0%	0%	0%	0%
2005*-2013	100%	46%	0%	-1%	29%	21%	1%	2%	0%	0%	0%	1%	0%	25%
2013*-2021	100%	38%	1%	4%	14%	26%	4%	10%	1%	0%	0%	2%	0%	43%
2021*-2023	100%	52%	0%	-7%	23%	10%	4%	-11%	-7%	28%	1%	8%	-1%	31%

*base year.

Source: own calculations.