

Which Occupations Should Get Skilled Worker Visas?

Informing the UK's Visa Reform

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Abstract

The United Kingdom's 2025 immigration reforms will restrict access to Skilled Worker visas for "mid-skill" occupations unless they are retained on a revised shortage list. This raises an important policy question: which occupations should continue to receive access, given the limits of domestic labour supply and the effects of labour shortages on the government's industrial strategy objectives?

This paper brings together Home Office visa data, Department for Education apprenticeship data, and Migration Advisory Committee labour demand indicators to assess where Skilled Worker visas function as a critical source of new trained labour and where domestic training pipelines are least able to respond quickly to additional demand. We show that dependence on visas varies substantially across occupations and sectors. For many roles, the loss of visa access would create a significant supply shock that could not readily be offset through apprenticeships, particularly given long training lead times and weak completion rates. We further show that recent reductions in visa recruitment have not been matched by increases in apprenticeship starts, suggesting that domestic training may not automatically scale to replace visa flows, at least in the short run. In this context the government must consider its tolerance for demand destruction in the interim.

We finally construct an index ranking occupations for continued visa access across multiple factors, for use as an input in visa prioritisation decisions. The strongest case for continued visa access is where occupations combine high dependence on skilled migration, constrained domestic pipelines, strong labour demand, and strategic importance. These dynamics are especially salient in parts of the clean energy workforce, where labour shortages may impede delivery of wider policy goals.

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Acronyms

Acronym	Definition
IS-8	Industrial Strategy sectors
ISL	Immigration Salary List
MAC	Migration Advisory Committee
n.e.c.	Not elsewhere classified
NQF	National Qualifications Framework
RQF	Regulated Qualifications Framework
SOC	Standard Occupational Classification
TSL	Temporary Shortage List

Introduction

The United Kingdom (UK) is currently in the process of making major changes to its Skilled Worker visa. All “mid-skill” occupations, unless on a shortlist of exemptions, will no longer be eligible to access the visa. For some occupations, skilled migrants supply most of the new worker pipeline; a sudden ban on recruitment would pose a serious risk to policy goals. This is especially the case for visas related to the UK’s “Clean Energy Mission”, which faces severe workforce constraints (ESNZ Committee, 2025) and relies heavily on visas for many key occupations (Huckstep and Dempster, 2025).

This paper is intended to inform discussions regarding which occupations should be on the list of exemptions. To do so we harmonise Home Office visa data, Department for Education apprenticeship data, and Migration Advisory Committee (MAC) labour demand indicators to show where visas provide a pressure release valve for labour supply, and where domestic pipelines are least able to compensate quickly.

The government’s stated aim is to incentivise employers to increase investment in domestic training by reducing access to visas. This might happen, but is not a given. Employers could respond in several ways: they may increase investment in domestic training, but they could also reduce activities, invest in automation, offshore tasks, or raise wages to compete for workers who are already trained. For many of the occupations under consideration, these responses—including increased domestic training—are either not possible at scale in the short term, would not alleviate sector-wide shortages, or would increase the cost of labour outputs to a level that might cause demand destruction.

Our analysis of new apprenticeship starts and visa use suggests that employers do not use apprenticeships and visas interchangeably: visa use for the occupations under consideration has fallen over recent years due to previous efforts to limit international recruitment, but apprenticeship starts have not risen commensurately to compensate. In some cases (where visa use is still high relative to apprenticeship rates that remain low) replacing lost foreign-trained workers with domestic workers would require an increase in apprenticeship starts of more than 100 percent.

Moreover, even if tighter migration policy does induce more training, additional trained domestic supply will arrive only after a lag, often of years. In this period labour supply shortfalls can be expected to negatively impact the UK’s ability to achieve the (often ambitious) goals set out in the Industrial Strategy.

We then draw out implications for how the MAC and government departments could prioritise between occupations for continued access, and construct an index showing occupations’ “deservingness” of visa access. We pay particular attention to visas needed for the green transition, noting that in the context of workforce shortages an individual worker can contribute significant carbon abatement and energy generation benefits.

Changes to the Skilled Worker visa policy

In May 2025 the UK government published a white paper on immigration (Home Office, 2025a). Several of the key changes are intended to reduce net migration to the UK. Notably, it significantly increased fees charged to employers; eliminated lower wage thresholds for shortage occupations; and reduced the list of jobs eligible for the Skilled Worker visa. Occupations assessed as “mid-skill”—falling between levels 3 and 5 of the Regulated Qualifications Framework (RQF)—would no longer be eligible. Employers could only sponsor foreign workers at these levels if their occupation was placed on a revised Temporary Shortage List (TSL) by the MAC. The TSL was reduced in length in July 2025 (Home Office, 2025c), maintained until the end of 2026; the product of the MAC’s current investigation will replace it beyond that (MAC, 2025b).

These changes were developed further in the June 2025 “Industrial Strategy” (DBT, 2025). This tied the revised TSL to the new set of eight sectors prioritised for government interventions (IS-8). It also reintroduced salary discounts for shortage roles via the Immigration Salary List (ISL) as a form of industrial policy (the MAC recommends no salary discounts on the TSL (MAC, 2025a)).¹ Occupations would be placed on the TSL if “an appropriate plan”, possibly including a formal sector workforce strategy, was adopted by employers to develop domestic skills and increase local recruitment (DBT, 2025: 71).

Using visa policy changes to incentivise training investments

The stated goal of the government is to incentivise employers to invest in domestic training by reducing access to international recruitment (Home Office, 2025a). It is unclear whether this will happen. The MAC (2024) has warned that there is no clear causal link between employers’ use of international recruitment and investment in apprenticeships, and that reductions in apprenticeships may be due more to changing funding structures and employer need than to access to visas.

While the government has required that sectors demonstrate “an appropriate plan” before retaining access to visas, its ability to verify the policy’s effectiveness is limited. As the Migration Observatory notes, a sectoral approach could allow free-riding, while it is hard to monitor commitments by individual employers (Brindle and Sumption, 2026). Moreover, the apprenticeship system is widely accepted to face severe challenges requiring lengthy reforms (The St Martin’s Group, 2024; Wolf, 2025; Field, 2025; Industry and Regulators Committee, 2024; British Chambers of Commerce, 2026).

An apprenticeship is a paid job combined with structured training for a specific occupation. The supply of apprenticeships is thus led by employers’ perceived long-term demand for workers. An employer must choose an approved apprenticeship standard and training provider, use the

¹ The TSL provides time-limited access to visas for specific shortage roles. This list does not provide salary discounts. Salary discounts are only available to occupations on the ISL, for which the minimum salary is 80 percent of the usual minimum rate; not all TSL occupations are also on the ISL. The ISL is expected to be phased out in future changes and replaced by the TSL; as of March 2026 they are coexistent and do not fully overlap (Home Office, 2025b).

apprenticeship service, and agree a training plan. This structure means that the government has limited control over employers' training choices: whether an employer takes on an apprentice is a function of their anticipated forward demand. Apprenticeships take between eight months and four (or more) years to complete, and thus the employer must have confidence in the long-term operating environment to take on the risk. It is also a function of the provision of training capacity; many sectors face shortages of trainers and other staff (DESNZ, 2025).

In this context, losing access to Skilled Worker visas may see employers limit activities rather than take the risk of investing to train an apprentice. Research from Korea, for example, finds that the suspension of a low-skilled guest worker programme led to firm exit rather than an expansion of domestic hiring (Lee et al., 2026); research from the United States similarly suggests that firms unable to access immigrant labour respond by curbing production, and that domestic hiring in fact decreases (Clemens and Lewis, 2024).

Employers could also, in theory, attempt to respond to lost labour supply by raising the productivity of their existing workers through investment in automation, or by offshoring work, rather than by curbing activities or increasing domestic training. Many jobs on the TSL, however, can only be automated to a limited degree, and are in addition highly location-constrained: they cannot be offshored. Finally, employers may also seek to increase wages to compete for workers already present in the country (Filippucci et al., 2025). We discuss this later: many of these occupations are shared across multiple sectors, and competition is likely to occur. In the short-term, this would increase the cost of obtaining labour, raising the cost of the marginal unit of labour output. This may lead to demand destruction, which might be an undesirable outcome where labour output is of strategic importance: the government must balance its priorities, and assess how much demand destruction it is willing to tolerate in exchange for a long-term rise in domestic training.

Finally, rising wage costs may indeed incentivise employers to increase supply via apprenticeships. There is little empirical evidence on the elasticity of training offers to wages. In Switzerland, a 10 percent increase in hiring costs is associated with a roughly 2.9–4.8 percent increase in the probability of training at least one apprentice, and an apprenticeship-count elasticity of 1.4. In Germany, by contrast, no link is found—possibly due to the higher cost of apprenticeship training (Aepli et al., 2024). In the UK, the probability of an employer offering an apprenticeship has previously been found to increase by 2.1 percentage points for each extra hard-to-fill vacancy for skilled trade workers (Mcintosh et al., 2011). Where this happens, starts may also respond with a lag—evidence from Germany suggests a possible lag of 3 to 12 months in which employers assess the situation (Lüthi and Wolter, 2020). Apprenticeship reforms or economic uncertainty may also delay employer responses (Majumdar, 2007).

If employers do respond to reduced supply of trained workers by investing more in training new entrants, there will therefore be a lag in which they: (i) recognise the changed supply environment; (ii) judge whether demand is likely to persist; (iii) expand their training capacity; and (iv) train

workers to full competence. This outcome also depends on sufficient capacity among local off-the-job training providers with which the employer would need to partner; there may be a further lag in which they respond to new employer demand for training. During this period supply of labour inputs would be reduced, increasing costs and leading to some degree of demand destruction.

The purpose of the TSL is, in essence, to provide a recruitment “bridge” to allow employers access to key occupations—and thus avoid demand destruction—while incentivising them to scale up their training capacity in preparation for a future cut-off. The effectiveness of the “bridge” mechanism relies on employers believing that demand will persist long enough to justify investment in training; having the capacity to take on and supervise trainees; sourcing local off-the-job training provision; and being able to scale supply within a useful timeframe.

Where these elements are not available, restrictions on visas are likely not to induce rapid substitution towards domestic training, but instead to reduce labour supply, raise project costs, delay delivery, and suppress output. In designing the TSL, it is crucial that it: (i) includes occupations for which adequate domestic substitution will not be possible within relevant timeframes; (ii) includes occupations for which the loss of labour outputs would be strategically undesirable; and (iii) offers a long enough “bridge”, and is accompanied by enough supply-side support, that domestic training in those occupations can scale to meet needs before international recruitment becomes inaccessible.

The occupations under consideration for the TSL

The MAC is currently reviewing visa access via the new TSL for the 82 occupations previously on the ISL. These occupations are grouped according to the Industrial Strategy (IS-8) sectors to which they are relevant. An additional sector, “Foundational Industries / Critical Infrastructure”, is also used, and several occupations are not clearly relevant to a lead sector. Most occupations overlap between multiple sectors. They are all considered to be at RQF levels 3–5, so will automatically be excluded from Skilled Worker visa access (MAC, 2025b). These occupations include technicians; artists; welders; and sewage operators. The full list of occupations is available in the Appendix. The distribution of occupations across sectors is given in Table 1; note, as discussed later, that many occupations are shared across multiple sectors. Clean Energy, with 43 occupations, has the most of any sector, although only 9.3 percent of these are not shared with another sector.

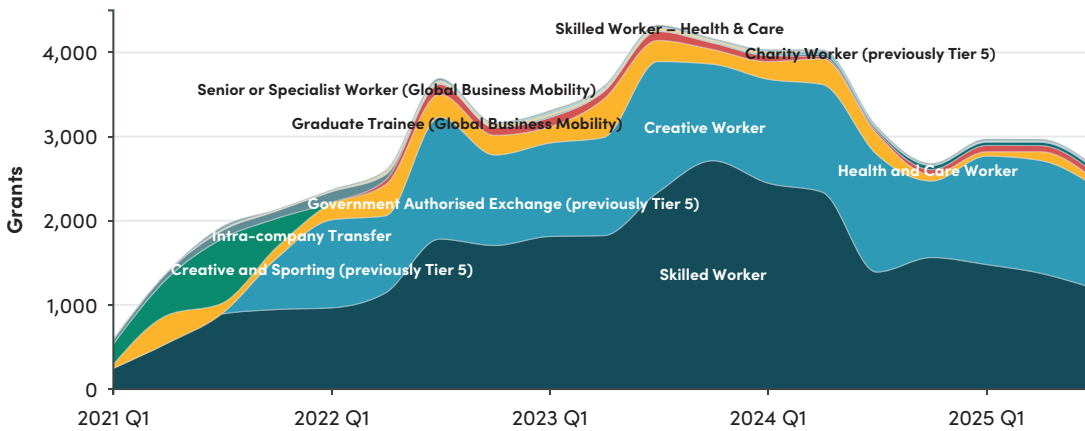
TABLE 1. Distribution of MAC-list occupations across sectors

Sector Tag	Occupations Tagged
Advanced Manufacturing	20
Clean Energy	43
Creative Industries	12
Defence	5
Digital and Technology	15
Financial Services	9
Foundational Industries/Critical Infrastructure	31
Life Sciences	3
No Clear Lead Sector	8
Professional and Business Services	10

Note: This is a static version of an interactive table. The full version can be found on the [CGD website version of this paper](#).

For most sectors and occupations, the Skilled Worker visa is the primary visa used for international recruitment. This is not the case across the board: the Creative Industries sector, unsurprisingly, makes heavy use of the Creative Worker visa, and thus is less exposed to changes to Skilled Worker visa policy. For priority sectors such as Advanced Manufacturing, Clean Energy, or Foundational Industries, however, Skilled Worker visas are critical (Figure 1).

FIGURE 1. MAC-list visas to the UK by visa type sub-group



Note: This is a static version of an interactive chart. The full version can be found on the [CGD website version of this paper](#).

Assessing the implications for labour supply

As will be described below, many of these occupations will soon see a spike in labour demand at the same time as losing access to Skilled Worker visas. This will therefore require an increase in the capacity of the apprenticeship system. But how reliant are these occupations on Skilled Worker visas now? And can the domestic training pipeline scale, and scale quickly enough, to fill needs?

To answer these questions, we harmonise apprenticeship data with visa data (as set out in the methodology) to allow a comparison of labour supply channels over time. We take apprenticeships at National Qualifications Framework (NQF) Levels 2 and 3 as proxies for new entry, given that higher-level apprenticeships are often used for upskilling by existing trained workers.

For most of the occupations in question, it is safe to view these two supply channels as an adequate proxy for new trained labour-market intake. This is not the case for all, however: some occupations on the MAC's list draw new entrants from degrees as well as apprenticeships; don't draw from apprenticeships at all; or are poorly mapped to apprenticeship pathways. We therefore bucket occupations according to the reliability of apprenticeships as a domestic workforce entry proxy (per Skills England's mapping of expected education by 4-digit standard occupational classification (SOC) code) (Skills England, 2025).² We include these buckets across our analysis to aid interpretation:

- **Predominantly apprenticeships:** the highest expected education is NQF Level 3.
- **Mixed pipeline:** expected education includes low levels, but also NQF Levels 4/5 and over.
- **Weak apprenticeship proxy:** expected education is NQF Level 6 and over.

The loss of access to visas will come as a supply shock. Assuming that the flow of entrants reflects demand for qualified workers, the apprenticeship system would need to replace lost visas with new throughput of trainees if demand is to be met. For many areas this will be difficult: apprenticeship completion rates are stubbornly low. In Table 2 we show key data across all IS-8 occupations under consideration. For many occupations, the loss of visas would require huge increases in domestic training: in some cases, more than double.

² Note that Skills England's mapping of expected education levels deviates from that used by the MAC.

TABLE 2. Skilled Worker visas vs. apprenticeship entrances to MAC-list occupations

IS-8 sector Occupation (SOC 2020 unit group) Rows

All sectors All occupations 10 Filters Download full dataset CSV

Sector: All sectors Occupations shown: 82 / 82 Skilled Worker visa share of entrants (rows with data): Average: 27%

Entry pipeline mix: 82
 Predominantly apprenticeships: 52 Mixed pipeline: 19
 Weak apprenticeship proxy: 11

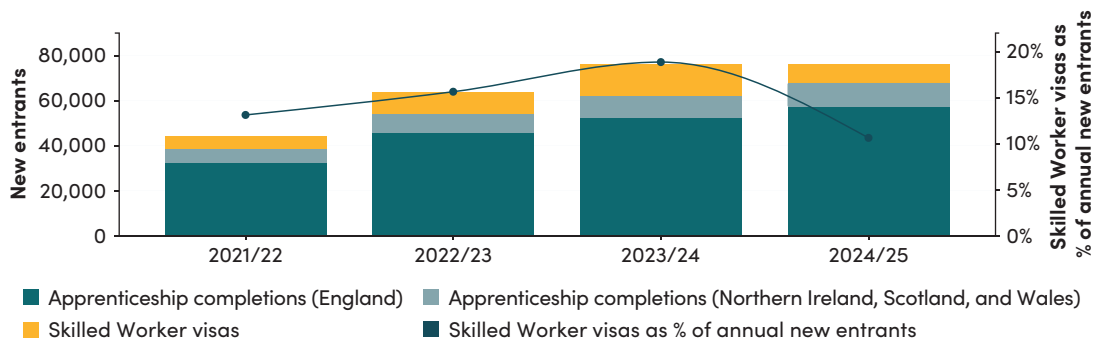
SOC	Occupation	Entry pipeline	Apprenticeship completions per year	Skilled Worker visas per year	Skilled Worker visa share of entrants	Apprenticeship starts	Apprenticeship achievement rate	Additional starts needed	Additional starts needed as share of starts	Average time to complete (months)
3581	Inspectors of standards and regulations	Mixed pipeline	4	63	95%	95	—	—	—	—
5244	Computer system and equipment installers and servicers	Predominantly apprenticeships	4	50	90%	36	—	—	—	—
3115	Quality assurance technicians	Predominantly apprenticeships	8	93	89%	12	—	—	—	—
3133	Database administrators and web content technicians	Predominantly apprenticeships	11	109	87%	24	—	—	—	—
5212	Metal plate workers, smiths, moulders and related occupations	Predominantly apprenticeships	22	99	82%	59	60%	165	279%	—
3112	Electrical and electronics technicians	Predominantly apprenticeships	19	71	74%	83	—	—	—	—
5221	Metal machining setters and setter-operators	Predominantly apprenticeships	18	49	73%	1,475	50%	98	6.6%	—
3552	Business sales executives	Mixed pipeline	279	706	70%	498	57%	1,229	247%	—
5330	Construction and building trades supervisors	Predominantly apprenticeships	31	66	68%	213	50%	133	62%	—
5312	Stonemasons and related trades	Predominantly apprenticeships	28	47	62%	59	64%	72	122%	—

82 occupations match your current filters. Page 1 of 9

Note: This is a static version of an interactive table. The full version can be found on the CGD website version of this paper.

Dependence on Skilled Worker visas varies across sectors and occupations, and by time. In Figure 2, we show visas as a percentage of total new entrants (across apprenticeships and visas) into individual IS-8 occupations, by sector from academic year 2021/22–2024/25.³ Across the Advanced Manufacturing sector, for example, visas peaked at 18 percent of observed new entrants in the academic year 2023/24, falling to 11 percent in 2024/25. Due to the long lead-times of most apprenticeships, domestic supply of fully trained workers lags visa policy changes by twelve months to several years.

FIGURE 2. Workforce entries via Skilled Worker visas and apprenticeship completions



Note: This is a static version of an interactive chart. The full version can be found on the CGD website version of this paper.

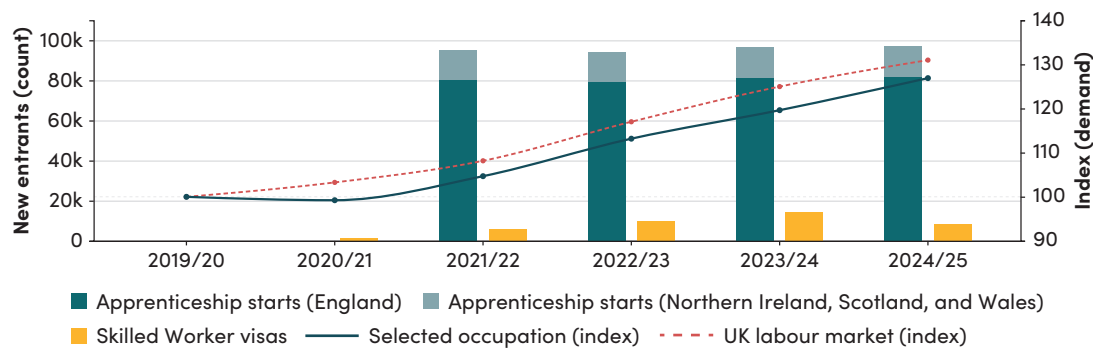
³ Apprenticeship data is held by academic year, and cannot be reliably converted to calendar year; we therefore harmonise visa data with apprenticeship data by academic year.

Assessing labour supply versus demand

The stated purpose behind the Skilled Worker visa reform is to incentivise UK employers to train more domestic workers. Looking at the data on apprenticeship starts for recent years, it does not appear that employers use apprenticeships and visas interchangeably. The total number of Skilled Worker visas obtained across the list of priority occupations fell from 14,317 in 2023/24 to 8,019 in 2024/25 (a 44 percent decrease) following policy changes intended to reduce international recruitment (Brindle and Sumption, 2025), but apprenticeship starts across those occupations remained very stable, rising by roughly 500—not enough to offset the loss. This is consistent with the idea that visas act as a release valve at the margin for employers: if this is the case they may not be substituted for by apprenticeship starts, which require long-term investment certainty.

As noted, apprenticeship supply may increase after a lag, or may only increase when a demand threshold is surpassed. For this reason, we consider how the supply of new apprenticeship starts interacts with labour demand indicators and access to visas. The MAC (2025b), in its call for evidence, supplies data on earnings and on labour demand as proxied by online job adverts (obtained from Lightcast). In Figure 3, we stack a set of labour supply indicators against these two demand indicators, which we index from 2019/20. From 2019/20 onwards, total employee job volumes across the occupations considered have remained very stable. (This is not the case for all occupations, however: some have declined over the period.) Given that total apprenticeship starts have also remained stable, this suggests that on aggregate a combination of access to visas and gradual improvement in apprenticeship completion rates has buffered against retirements. Completion rates are not, however, on an inevitable upward trend; the reported rate for air-conditioning technicians, for example, fell from a low 27.4 percent in 2022/23 to a very low 15.4 percent in 2023/24. This is a major challenge, and exacerbates workforce under-supply in the context of very low visa use and rocketing job advert intensity.

FIGURE 3. Training and Skilled Worker visa use vs. demand signals



Notes: Labour demand indicators are indexed to 2019/20 where available (2019/20 = 100); where the selected occupation has no 2019/20 value, the index is based on its earliest available year. Apprenticeships and Skilled Worker visas are not available for 2019/20–2020/21 and are shown as blank. Annual earnings are derived from April ASHE snapshots within the academic year; job adverts are new postings in April within the academic year. This is a static version of an interactive chart. The full version can be found on the [CGD website version of this paper](#).

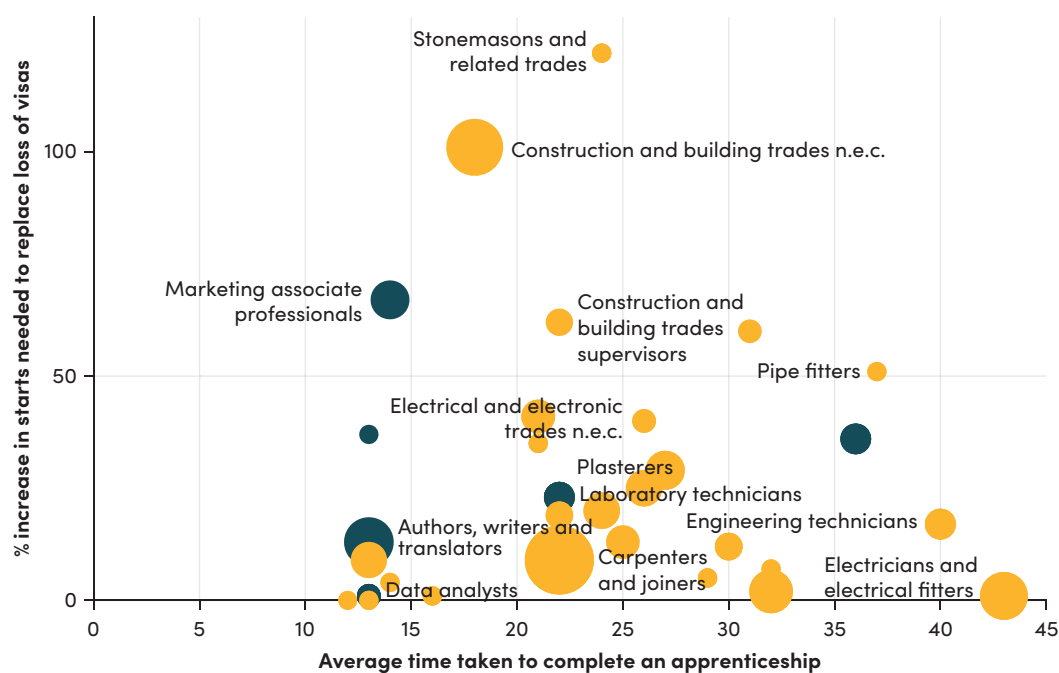
As discussed earlier in the paper, migration could be used as a bridge while training increases. This will be especially needed where labour demand is anticipated to rise sharply to meet policy goals for occupations with long training times. Skills England (2025) have projected total employment increases for IS-8-relevant occupations to 2030; in Figure 4 we map these increases against the percentage increase in apprenticeship starts needed to offset lost visas and the time taken to complete an apprenticeship, showing projected employment increases by the size of bubbles. Several occupations occupy a worrying place on the chart. The “Construction and building trades (not elsewhere classified (n.e.c.))” occupation currently receives 56 percent of new entrants from visas; replacing them will require an *increase in starts* equal to more than 100 percent of current training levels, with workers taking a year and a half to complete training. At the same time, demand is expected to rise by 17,000 workers by 2030, thanks in part to a government housebuilding effort— throttling labour supply would worsen delivery challenges. A similar story is true of “Welding trades”, “Pipe fitters”, “Electrical trades (n.e.c.)”, and “Engineering technicians”, among others.

FIGURE 4. Domestic training may struggle to meet needs absent visas

Apprenticeship starts needed to compensate for the loss of Skilled Worker visas versus the average time taken to complete an apprenticeship

How dominant are apprenticeships in contributing workforce entrants?

- Predominantly apprenticeships
- Mixed pipeline



Notes: For data approaches, please see the associated methodology note. In the chart, bubble size corresponds to projected employment growth from 2025–2030 per Skills England modelling. Note that projected employment *growth* is not the same as total labour needs, and does not capture replacement demand. We exclude SOC 3417 (‘Photographers, audio-visual and broadcasting equipment operators’), a significant outlier. This is a static version of an interactive chart. The full version can be found on the [CGD website version of this paper](#).

Skills England’s projections don’t cover all of the MAC’s considered occupations. They also, importantly, don’t factor in replacement demand generated by retirements; instead they assume that current supply fully meets replacement needs. This is a major gap, given that replacement demand is estimated by the Working Futures project to typically outstrip expansion demand by a factor of around seven to one (Department for Education, 2020). As can be seen in Figure 3, even with visas, total employment in some shortage occupations is currently falling. In our index for visa inclusion we use modelled replacement demand estimates created by the Skills Imperative 2035 project as a proxy (Department for Education, 2024), but these are only indicative at the occupation level and have not been updated since August 2024.⁴

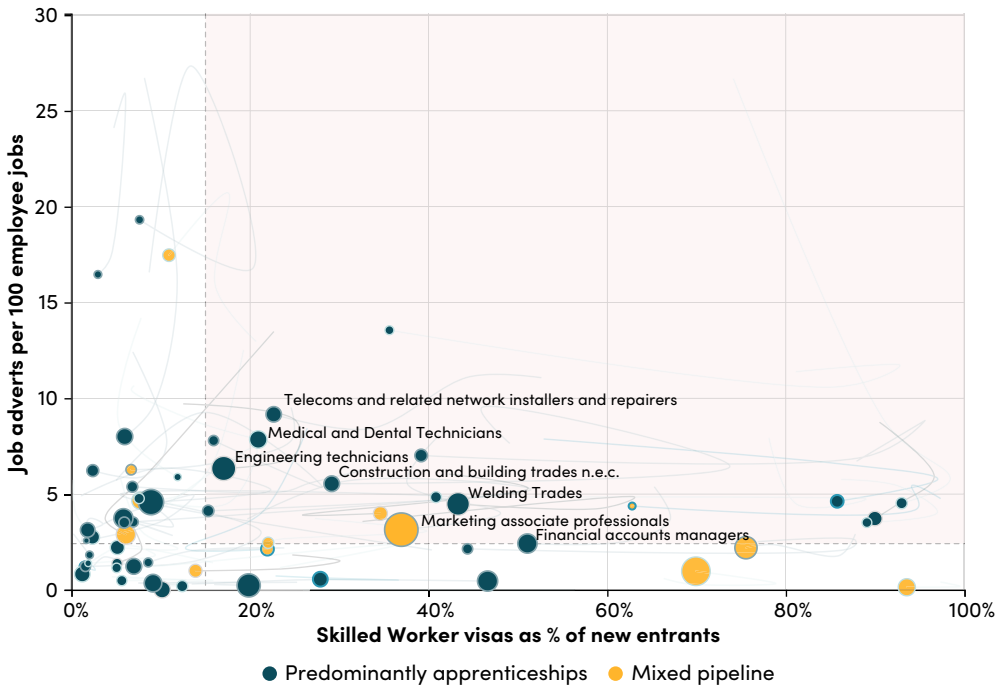
Competition between IS-8 sectors will also make it harder for any individual sector to meet demand: the same sets of skills are often flagged as required by multiple sectors, and may be highly valued for strategic purposes (including in the defence sector). At the same time, historically, many of the occupations on the MAC’s list are not, comparatively speaking, abnormal in their use of visas or their job advert intensity.

In Figure 5 we show use of Skilled Worker visas as a percentage of all new entrants (apprenticeship completions and visas) versus job adverts per 100 employee jobs across 2021/22–2024/25, colouring by pipeline and inter-sectoral competition. We define a quadrant (in pink) with a threshold at the average for each axis across *all* UK occupations in the “Predominantly apprenticeships” or “Mixed pipeline” buckets. For much of the time period, many listed occupations are not above the UK average in either metric. This should, however, be taken with a pinch of salt: Lightcast data is gathered from online job listings, which may not be a good proxy for all occupations; multiple occupations are listed as having job advert intensity near or at zero.⁵

4 Note that these modelled estimates are highly uncertain; for most shortage list occupations the modelling suggests a replacement demand (from retirements, mortality, inter-occupational mobility, etc.) of more than 25 percent, and for some of more than 100 percent, of total 2024/25 occupational employment.

5 This is because many manual occupations may not advertise posts on LinkedIn or similar platforms, limiting their legibility to web-scraping tools.

FIGURE 5. Skilled Worker visa use vs. competition for hires



Note: This is a static version of an interactive chart. The full version can be found on the [CGD website version of this paper](#).

Occupations outside this quadrant might have less need of retaining discretionary visa access. It is also possible, however, that these may be strategically important skillsets whose loss, even for a short period, would have major ramifications for policy goals with spillover effects. In these cases, the effects of the lag between loss of visas and hypothesised domestic catch-up could outweigh the government’s interest in incentivising domestic training.

This is likely to be true, for example, for “Electrical and electronic trades n.e.c.” (SOC 5249), the occupation within which lineworkers sit (Skills England, 2026). Lineworkers are crucial for grid buildout, now ramping up (National Grid, 2026). They are reported by industry sources to be in critically short supply (Energy Networks Association, 2025; Millard and Kerr, 2026): new demand, combined with retirements, exceeds current supply (Harkness et al., 2025). Their work has major implications for decarbonisation, energy prices, and wider fiscal outcomes (Arup, 2026). This is especially the case in the context of spiking energy prices, when curtailment of generation due to grid buildout delay becomes relatively more expensive. The rapid increase in demand is reflected in an increase in Skilled Worker visas from 13.5 percent of all observed new entrants in 2021/22 to 46.6 percent in 2024/25. At the same time, they are also reported to have only 0.5 job adverts per 100 employee jobs, well below the market-average quadrant cut. Even if the data could be considered reliable, the importance of the occupation’s contribution to broader outcomes is such that ensuring that supply can respond rapidly to demand is likely to be a worthwhile policy choice.

Occupations within the Clean Energy sector

In its impact assessment of the 2025 visa changes, the Home Office (2025c: 14) argued that loss of access to visas would have “no meaningful impacts” on decarbonisation goals. If anything, the Home Office proposed, loss of visa access would have carbon *benefits* due to a reduction in travel.

This is far from given. The Energy Security and Net Zero (ESNZ) Committee of the House of Commons, in an inquiry into the state of the UK’s clean energy workforce situation, concluded that domestic supply alone would not meet needs in the timeframes required (ESNZ Committee, 2025). Targeted use of visas to supplement the domestic workforce, therefore, is crucial to the UK’s ability to achieve its decarbonisation goals. This conclusion echoes previous findings by the National Energy Systems Operator, the Climate Change Committee, and numerous relevant stakeholders (Huckstep and Dempster, 2025). In its response to the inquiry, the government reiterated its intention to incentivise domestic training, but also acknowledged the need to include relevant occupations on the new shortage list (HMG, 2026).

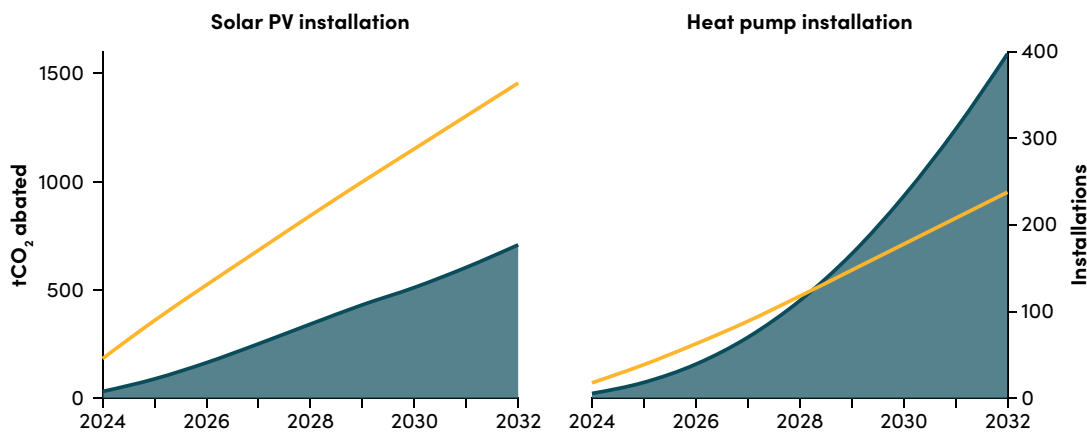
Modelling by CGD suggests that on a per-worker basis, access to visas can make a major decarbonisation contribution (Huckstep and Harnoss, 2026). Under the assumption that each additional worker alleviates a binding labour constraint on installations, an electrician who had arrived in the UK in 2024 and worked through to 2032 would allow the abatement of 700 tonnes of CO₂.⁶ This is, for comparison, the equivalent of planting over 3,000 trees and leaving them to grow for 50 years. A heating technician installing residential heat pumps would have a still bigger carbon impact (Figure 6). They would also allow household savings and reduce household use of imported fuel, an attraction given continued supply volatility (Rathi, 2026; Rocha and Mazneva, 2026). Contrary to the Home Office’s suggestion, moreover, the carbon costs of travel from likely countries of origin are far outstripped by the worker’s abatement contribution.

6 This modelling assumes that this “marginal” worker alleviates a binding labour constraint to allow additional installations that would otherwise not occur; for more detail see the methodology in Huckstep and Harnoss (2026).

FIGURE 6. A single worker can have a big CO₂ impact

Modelled CO₂ emissions reduction contribution of a worker installing residential solar PV or heat pumps, 2024–2032

■ Total installations ■ CO₂ abated, cumulative tonnes



Note: This is a static version of an interactive chart. The full version can be found on the [CGD website version of this paper](#).

Source: Huckstep and Harnoss (2026).

It is therefore important that access to visas is maintained for sectors key to decarbonisation.

At the same time, however, this is an area in which international recruitment could cause a “brain drain” from countries of origin, harming their own ability to decarbonise and expand energy access. In some cases, the UK’s recruitment of workers could have, on net, a harmful effect on global decarbonisation: higher grid carbon intensity in countries of origin mean that if workforce constraints are equally binding there as in the UK, international recruitment may harm country of origin decarbonisation more than it helps the UK’s (Huckstep and Harnoss, 2026). It is not inevitable that these workers’ departures leave a decarbonisation gap—but we recommend that the UK assess whether this is a risk, and partner with these countries to support mitigatory training if so (see Dempster and Huckstep, 2024). Given that decarbonisation is a global public good, bottlenecks elsewhere caused by UK international recruitment could be detrimental to UK interests.

Which occupations should remain on the TSL?

The outstanding question is that of prioritisation. The response must be informed by multiple factors. To answer it, we create an index synthesising a collection of key indicators to provide an indicative ranking of occupations for retaining visa access. We caution, however, that it is only indicative: key data is missing, which may outweigh the data included.

We build the index from two subindices: a ‘core visa need’ index comprising predominantly labour supply indicators, and a ‘forward pressure’ index made up of current and modelled labour demand indicators. This latter index contains less reliable data (the patchy Lightcast data and projections

or modelling), so we set its weight in the default index to a modest 0.15.⁷ We summarise these indices in Table 3; the full methodology is available in the associated note.

TABLE 3. Components of the visa prioritisation index

Subindex	Component	Default Component Weight within Subindex
Core visa need score <i>85 percent total weight (default)</i>	Visa intensity: visas as an adjusted proportion of total occupation employment.	20 percent
	Visa share of entrants: visas as a proportion of apprenticeship completions.	20 percent
	Shortfall in apprenticeship response: recent uplift in apprenticeship starts, adjusted for completion rates and training duration, relative to visas.	20 percent
	Training lag: time taken to complete an apprenticeship.	20 percent
	Relative wage pressure: excess hourly wage growth versus economy-wide change.	20 percent
Forward demand pressure <i>15 percent total weight (default)</i>	Job adverts: adverts per 100,000 employee jobs.	33 percent
	Projected occupation growth: total employment growth from 2025–2030.	33 percent
	Modelled replacement demand: replacements needed due to retirement, morbidity, or inter-occupation mobility from 2025–2030.	33 percent

However, as both the Immigration White Paper (Home Office, 2025a) and the Industrial Strategy (DBT, 2025) note, visa access is also a matter of securing labour outputs with strategic importance. This is fundamentally the approach taken by the new TSL system. We therefore apply a “strategic overlay” multiplier before the final ranking. This reflects that the more sectors to which an occupation is relevant, the more its labour outputs can be presumed to be valued; and that some sectors may be more strategically important than others. The initial weights applied to the multiplier are the following:

- A 0.03 multiplier for each sector after the first
- A 0.07 multiplier for relevance to either the Clean Energy or Defence sectors

These necessarily include a degree of subjectivity, hinging on how one prioritises between policy goals, how one assesses data reliability and inclusion, and how one weights different components. We assume that Clean Energy and Defence will currently be prioritised above other sectors. Users can edit these parameters, and all others, to model for other prioritisation and to weight components differently. There is, in addition, a concern regarding missing data: we do not, for example, have data on the fiscal effects of workers’ labour outputs.

7 Note that when the forward pressure module is toggled on and the Lightcast data is included, demand may be understated for some occupations that are poorly captured by online job-posting data, and the index may thus under-rank them.

We show the visa prioritisation index in Table 4. We flag two possible issues: some occupations have inadequate data coverage, and are excluded in the default setting; and some occupations have a small workforce (fewer than 10,000 employed), meaning that some indicators will have higher volatility and caution may be needed in interpreting results.

TABLE 4. Skilled Worker visa prioritisation index

Occupation	Entry pipeline	Core Score	Evidence Score	Multiplier	Final Score	Rank	Coverage	Small workforce
Metal plate workers, smiths, moulders and related occupations	Predominantly apprenticeships	90.6	87.9	1.07	94.0	1	High	Caution
Ship and hovercraft officers	Predominantly apprenticeships	85.1	79.0	1.10	86.9	2	High	Caution
Construction and building trades n.e.c.	Predominantly apprenticeships	71.5	73.3	1.10	80.6	3	High	No
Floorers and wall tilers	Predominantly apprenticeships	69.8	72.9	1.10	80.2	4	High	No
Welding Trades	Predominantly apprenticeships	68.1	64.6	1.23	79.5	5	High	No
Inspectors of standards and regulations	Mixed pipeline	67.4	66.6	1.13	75.2	6	High	No
Photographers, audio-visual and broadcasting equipment operators	Mixed pipeline	66.2	67.0	1.10	73.7	7	High	No
Quality assurance technicians	Predominantly apprenticeships	67.1	62.8	1.16	72.8	8	High	No
Telecoms and related network installers and repairers	Predominantly apprenticeships	63.6	66.2	1.10	72.8	9	High	No
CAD, drawing and architectural technicians	Mixed pipeline	62.3	60.9	1.16	70.6	10	High	No

Note: This is a static version of an interactive table. The full version can be found on the [CGD website version of this paper](#).

Following the prioritisation index in its default settings, “Metal plate workers” is the occupation with the strongest case for retaining access to visas (of the 64 with adequate data coverage): it has high visa intensity, long training duration, and high wage pressure, and is also a priority occupation for the Clean Energy sector. At the other end of the list is the “Science, engineering and production technicians” occupation, which despite its relevance to three sectors scores low across multiple indicators. “Marketing associate professionals”, the shortlisted occupation with the most visa grants since 2021, ranks only 43rd (despite the fact that its mixed pipeline status may mean that domestic labour supply is underestimated). Four occupations have inadequate data coverage to be ranked at all.⁸

The index is broadly stable under substantial alternative specifications, including changes to weighting choices and the removal of key components. It is useful as an indicator of broad bands of occupations likely to have a strong case for retaining access to visas. Predictably, however, there is volatility at the level of the individual ranking, and differences between adjacent ranks should not be over-interpreted. Sensitivity checks are provided in the methodology.

⁸ These occupations are “Dancers and choreographers” (3414); “Musicians” (3415); “Information technology trainers” (3573); and “Steel erectors” (5311).

Conclusion

Without workers, the government's Industrial Strategy priorities will not be met. Tightening visa access to incentivise domestic investment in training, though understandable, creates a material delivery risk. If visa access is restricted but domestic training does *not* scale to meet the triple pressure of policy-stimulated demand, replacement of retirees, and loss of visas, crucial targets will not be met. Moreover, it is by no means a given that the loss of visas will incentivise new apprenticeships: it may instead just lead to a slow-down in operations. (In its report, the ESNZ Committee (2025) recommended that the government set out options for conditionality, publishing studies of impacts; the government partially agreed but did not commit to do so.)

Our findings suggest that the strongest case for continued sponsorship (or recruitment via the TSL for a “bridging” period) is where (i) Skilled Worker visas provide a high proportion of inflows of new trained labour; (ii) domestic training has long lead times (and possibly low completion rates); (iii) demand is rising due to time-limited policy interventions; and (iv) the work that would go undone in the absence of workers is strategically important. In these cases—as, for example, for “Metal plate workers”, “Ship and hovercraft officers”, or “Welding trades”—visa use may be unavoidable if targets are to be achieved. Any configuration of migration and skills policy should take into account that domestic supply responses will lag the loss of international recruitment by several years.

This paper has set out new data to help prioritise which occupations retain access to sponsorship. The aim for government should be to balance two key goods: building domestic training pipelines while sustaining delivery of strategic outputs. In so doing, it should not forget that some—those related to the Clean Energy mission—have impacts beyond its borders.

Appendix

TABLE A1. Full list of occupations under consideration for the revised TSL

SOC 2020 Code	SOC 2020 Title	Relevant Sectors	RQF Level
1243	Managers in logistics	Foundational Industries/Critical Infrastructure, Advanced Manufacturing	RQF 3-5
1257	Hire services managers and proprietors	Professional and Business Services	RQF 3-5
1258	Directors in consultancy services	Professional and Business Services	RQF 3-5
3111	Laboratory technicians	Life Sciences, Advanced Manufacturing, Clean Energy, Digital and Technology	RQF 3-5
3112	Electrical and electronics technicians	Advanced Manufacturing, Digital and Technology, Clean Energy	RQF 3-5
3113	Engineering technicians	Advanced Manufacturing, Clean Energy, Defence, Digital and Technology	RQF 3-5
3114	Building and civil engineering technicians	Foundational Industries/Critical Infrastructure, Professional and Business Services, Digital and Technology, Clean Energy	RQF 3-5
3115	Quality assurance technicians	Digital and Technology, Life Sciences, Advanced Manufacturing, Clean Energy	RQF 3-5
3116	Planning, process and production technicians	Advanced Manufacturing, Digital and Technology, Clean Energy	RQF 3-5
3119	Science, engineering and production technicians n.e.c.	Digital and Technology, Advanced Manufacturing, Clean Energy	RQF 3-5
3120	CAD, drawing and architectural technicians	Professional and Business Services, Clean Energy, Foundational Industries/Critical Infrastructure, Digital and Technology	RQF 3-5
3131	IT operations technicians	No Clear Lead Sector	RQF 3-5
3132	IT user support technicians	Digital and Technology, Financial Services	RQF 3-5
3133	Database administrators and web content technicians	Digital and Technology	RQF 3-5
3213	Medical and Dental Technicians	No Clear Lead Sector	RQF 3-5
3411	Artists	Creative Industries	RQF 3-5
3412	Authors, writers and translators	Creative Industries	RQF 3-5
3413	Actors, entertainers and presenters	Creative Industries	RQF 3-5
3414	Dancers and choreographers	Creative Industries	RQF 3-5
3415	Musicians	Creative Industries	RQF 3-5
3417	Photographers, audio-visual and broadcasting equipment operators	Creative Industries, Clean Energy	RQF 3-5
3421	Interior designers	Creative Industries	RQF 3-5
3422	Clothing, fashion and accessories designers	Creative Industries	RQF 3-5
3429	Design occupations n.e.c.	Creative Industries, Professional and Business Services, Clean Energy	RQF 3-5
3512	Ship and hovercraft officers	Foundational Industries/Critical Infrastructure, Clean Energy	RQF 3-5
3520	Legal associate professionals	Professional and Business Services	RQF 3-5
3532	Insurance underwriters	Financial Services	RQF 3-5
3533	Financial and accounting technicians	Professional and Business Services, Financial Services	RQF 3-5

(Continued)

TABLE A1. (Continued)

SOC 2020 Code	SOC 2020 Title	Relevant Sectors	RQF Level
3534	Financial accounts managers	Financial Services, Digital and Technology	RQF 3-5
3541	Estimators, valuers and assessors	Financial Services, Foundational Industries/ Critical Infrastructure	RQF 3-5
3543	Project support officers	Defence, Clean Energy	RQF 3-5
3544	Data analysts	Digital and Technology, Financial Services, Advanced Manufacturing, Foundational Industries/Critical Infrastructure, Clean Energy	RQF 3-5
3549	Business associate professionals n.e.c.	No Clear Lead Sector	RQF 3-5
3552	Business sales executives	No Clear Lead Sector	RQF 3-5
3554	Marketing associate professionals	Professional and Business Services, Creative Industries	RQF 3-5
3556	Sales accounts and business development managers	Clean Energy	RQF 3-5
3571	Human resources and industrial relations officers	Professional and Business Services	RQF 3-5
3573	Information technology trainers	No Clear Lead Sector	RQF 3-5
3581	Inspectors of standards and regulations	Foundational Industries/Critical Infrastructure, Advanced Manufacturing, Clean Energy	RQF 3-5
3582	Health and safety managers and officers	Foundational Industries/Critical Infrastructure, Defence	RQF 3-5
4121	Credit controllers	Financial Services	RQF 3-5
4122	Book-keepers, payroll managers and wages clerks	Professional and Business Services	RQF 3-5
4129	Financial administrative occupations n.e.c.	Financial Services	RQF 3-5
4132	Pensions and insurance clerks and assistants	Financial Services	RQF 3-5
4159	Other Admin Occupations (nec)	Clean Energy	RQF 3-5
4214	Company secretaries and administrators	No Clear Lead Sector	RQF 3-5
5211	Sheet metal workers	Advanced Manufacturing, Clean Energy	RQF 3-5
5212	Metal plate workers, smiths, moulders and related occupations	Clean Energy	RQF 3-5
5213	Welding Trades	Advanced Manufacturing, Clean Energy, Defence, Foundational Industries/Critical Infrastructure	RQF 3-5
5214	Pipe fitters	Foundational Industries/Critical Infrastructure, Clean Energy	RQF 3-5
5221	Metal machining setters and setter-operators	Advanced Manufacturing, Clean Energy	RQF 3-5
5223	Metal working production and maintenance fitters	Advanced Manufacturing, Clean Energy, Foundational Industries/Critical Infrastructure, Defence	RQF 3-5
5224	Precision instrument makers and repairers	Advanced Manufacturing, Clean Energy	RQF 3-5
5225	Air-conditioning and refrigeration installers and repairers	Foundational Industries/Critical Infrastructure, Clean Energy	RQF 3-5
5231	Vehicle technicians, mechanics and electricians	Clean Energy, Advanced Manufacturing	RQF 3-5
5234	Aircraft maintenance and related trades	Advanced Manufacturing	RQF 3-5
5235	Boat and ship builders and repairers	Advanced Manufacturing	RQF 3-5

(Continued)

TABLE A1. (Continued)

SOC 2020 Code	SOC 2020 Title	Relevant Sectors	RQF Level
5241	Electricians and electrical fitters	Foundational Industries/Critical Infrastructure, Clean Energy	RQF 3-5
5242	Telecoms and related network installers and repairers	Digital and Technology, Clean Energy	RQF 3-5
5243	TV, video and audio servicers and repairers	No Clear Lead Sector	RQF 3-5
5244	Computer system and equipment installers and servicers	Digital and Technology	RQF 3-5
5245	Security system installers and repairers	Foundational Industries/Critical Infrastructure, Clean Energy	RQF 3-5
5246	Electrical service and maintenance mechanics and repairers	Clean Energy	RQF 3-5
5249	Electrical and electronic trades n.e.c.	Foundational Industries/Critical Infrastructure, Clean Energy	RQF 3-5
5250	Skilled metal, electrical and electronic trades supervisors	Foundational Industries/Critical Infrastructure, Advanced Manufacturing, Clean Energy	RQF 3-5
5311	Steel erectors	Foundational Industries/Critical Infrastructure, Clean Energy	RQF 3-5
5312	Stonemasons and related trades	Foundational Industries/Critical Infrastructure, Creative Industries, Clean Energy	RQF 3-5
5313	Bricklayers	Foundational Industries/Critical Infrastructure, Clean Energy	RQF 3-5
5314	Roofers, roof tilers and slaters	Foundational Industries/Critical Infrastructure, Clean Energy	RQF 3-5
5315	Plumbers & heating and ventilating installers and repairers	Foundational Industries/Critical Infrastructure, Clean Energy	RQF 3-5
5316	Carpenters and joiners	Foundational Industries/Critical Infrastructure, Clean Energy	RQF 3-5
5319	Construction and building trades n.e.c.	Foundational Industries/Critical Infrastructure, Clean Energy	RQF 3-5
5321	Plasterers	Foundational Industries/Critical Infrastructure, Clean Energy	RQF 3-5
5322	Floorers and wall tilers	Foundational Industries/Critical Infrastructure, Clean Energy	RQF 3-5
5323	Painters and decorators	Foundational Industries/Critical Infrastructure	RQF 3-5
5330	Construction and building trades supervisors	Foundational Industries/Critical Infrastructure, Clean Energy	RQF 3-5
5441	Glass and ceramics makers, decorators and finishers	Foundational Industries/Critical Infrastructure, Creative Industries	RQF 3-5
8113	Chemical and related process operatives	Foundational Industries/Critical Infrastructure, Advanced Manufacturing, Digital and Technology, Life Sciences	RQF 3-5
8133	Energy plant operatives	Foundational Industries/Critical Infrastructure, Clean Energy	RQF 3-5
8134	Water and sewerage plant operatives	Foundational Industries/Critical Infrastructure	RQF 3-5
8143	Routine inspectors and testers	Clean Energy, Advanced Manufacturing	RQF 3-5
9249	Elementary sales occupations n.e.c.	No Clear Lead Sector	RQF 3-5

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Methodology: Prioritising Skilled Worker visas for IS-8 occupations

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Summary

This methodology note covers our process in creating a consistent SOC (Standard Occupational Classification) 2020 unit-group evidence base with which to compare two key flows of workers into occupations: (i) visa grants, and (ii) apprenticeship achievements (newly qualified workers). This allows us to compare labour supply via visa grants against labour supply via domestic entry-level training, in order to estimate at the occupation level the scale of additional apprenticeship starts that would be needed to offset a loss of visa access; and assess how visa access should be prioritised.

We harmonise visa data across the transition from SOC2010 to SOC2020 using mass-preserving fractional crosswalks with row-level Hamilton rounding, and impute missing 2024 data. We map apprenticeship outcomes from standards to SOCs using mapping developed by Skills England. We convert calendar-year visa data to academic-year equivalents, and then merge it with apprenticeship series to obtain key SOC-level indicators. This gives a dataset at the SOC2020 4-digit unit-group level by academic year. We report, by SOC2020 unit-group: (i) average annual visa grants; (ii) average annual apprenticeship achievements; (iii) visas as a share of combined inflows; (iv) apprenticeship achievement rates; (v) the increase to apprenticeship starts required to replace lost visas under stylised assumptions; and (vi) a scenario-based months-to-train indicator.

We then create an index ranking occupations under consideration by need for visas. We construct this index using a combination of current or near-term supply and demand indicators; several noisier or longer-term demand indicators; and a multiplier reflecting strategic prioritisation of labour outputs under the “Industrial Strategy”.

This research is intended to support the Migration Advisory Committee (MAC) and departments in assessing the prioritisation of visas against the needs of Industrial Strategy priority sectors. Results should be interpreted as providing an input for decision-making, and should be complemented with additional data on projected replacement rates, labour demand, wages, apprenticeship system capacity, the strategic importance of tasks conducted by occupations, and other factors. The approach taken offers a flow and scaling comparison, but does not conduct new modelling of labour demand, occupational stocks, or general equilibrium responses.

Apprenticeships

Overview

We construct a consistent time series of apprenticeship training activity mapped to SOC2020 4-digit unit groups, to estimate: (i) apprenticeship-supported supply of newly qualified entrants by occupation and year, and (ii) the scale of additional apprenticeship starts required to offset a reduction in occupational inflows (e.g., from migration policy changes). The approach additionally estimates a typical training duration (months) for each SOC based on standard-level delivery durations and the mix of standards feeding into each SOC.

Data inputs

Symbol	Definition
$s \in \mathcal{S}$	Apprenticeship standard (ST code) in the historical apprenticeship dataset.
$t \in \mathcal{T}$	Time period (academic year, e.g., 2021/22).
$o \in \mathcal{O}$	SOC2020 4-digit unit group (occupation).
ℓ	Apprenticeship level category (e.g., Level 2, Level 3, Level 4+).

We use the following datasets, with links given in the sources section:

- (i) Apprenticeship counts by standard and year (starts, achievements, enrolments);
- (ii) A mapping from current apprenticeship standards to SOC2020 (possibly one-to-many);
- (iii) Information on successor standards for retired standards (known replacements and manual overrides);
- (iv) Achievement rates by standard and year; and
- (v) Approximate months-to-deliver for a subset of current standards.

Harmonising historical standards to current standards

Because the standard-to-SOC mapping is defined for current standards, we translate historical (retired) standards to one or more current equivalent standards prior to occupation mapping. For each original standard s , we define a set of replacements $R(s)$. Where s is not current, we substitute an outdated standard for its successor standard through web scraping or manual replacement; if s is already current, $R(s) = s$. Standards with no successor mapping are flagged as unmapped.

When a standard maps to multiple successors, we allocate activity using replacement weights (w^{repl}) that sum to one:

$$\sum_{r \in R(s)} w_{s \rightarrow r}^{repl} = 1$$

This is generally not the case; very few expired apprenticeships map to multiple current standards. Where this is the case, we use uniform weights for lack of better data:

$$w_{r \rightarrow o}^{repl} = \frac{1}{|R(s)|} \text{ for } r \in R(s)$$

Mapping standards to SOC2020 and composite allocation weights

Let $O(r)$ denote the set of SOC2020 occupations mapped to a current standard r . Where a standard maps to multiple SOCs, we allocate using occupation weights that sum to one.

$$\sum_{o \in O(r)} w_{r \rightarrow o}^{soc} = 1$$

In the absence of better data (e.g., from the DfE's Longitudinal Educational Outcomes dataset) indicating how apprenticeship graduates are distributed proportionally across occupations, we use uniform weights across mapped SOCs (w^{soc}):

$$w_{r \rightarrow o}^{soc} = \frac{1}{|O(r)|} \text{ for } o \in O(r)$$

The composite weight from original standard s to SOC o is:

$$w_{s \rightarrow o} = \sum_{r \in R(s)} w_{s \rightarrow r}^{repl} \cdot w_{r \rightarrow o}^{soc}$$

Allocating apprenticeship activity to SOC

For each measure X in $\{Start, Ach, Enrol\}$, we allocate standard-year totals to SOCs using the composite weights.

$$X_{s,t,o} = X_{s,t} \cdot w_{s \rightarrow o}$$

Constructing SOC-level achievement rates from standard-level outcomes

We attach achievement performance using standard-level outcomes (leavers and achievers).

Let $L_{s,t}$ denote the number of leavers from apprenticeship standard s in academic year t , and $A_{s,t}$ the number of achievers (completions). Where the DfE's dataset provides an achievement rate, we treat it as a derived quantity:

$$rs,t = \begin{cases} \frac{A_{s,t}}{L_{s,t}}, & L_{s,t} > 0, \\ \text{missing}, & L_{s,t} = 0. \end{cases}$$

Allocating achievers and leavers to SOC using composite mapping weights

We define composite allocation weights from historical standard i to SOC2020 occupation o as $\omega_{i,o}$, incorporating (i) any replacement mapping from retired standards to current standards and (ii) any one-to-many standard-to-SOC mapping weights. (Where a mapping is one-to-many and no empirical shares are available, we assume weights are uniform across mapped SOCs.)

For each standard-year record, we allocate counts to SOCs:

$$L_{o,t} = \sum_i L_{i,t} \omega_{i,o}, \quad A_{o,t} = \sum_i A_{i,t} \omega_{i,o}$$

This preserves totals by construction (up to floating-point error), provided that $\sum_o \omega_{i,o} = 1$ for mapped standards i .

SOC-level achievement rate

We then compute the SOC-level achievement rate as the achiever share of leavers:

$$r_{o,t} = \begin{cases} A_{o,t} / L_{o,t}, & L_{o,t} > 0, \\ \text{missing}, & L_{o,t} = 0. \end{cases}$$

We prefer this approach to averaging standard-level rates because it weights each standard by its throughput ($L_{s,t}$), and ensures that SOC rates reflect the underlying volume of completions.

Expected completions implied by starts

Let $S_{o,t}$ denote apprenticeship starts mapped to SOC o in year t . We interpret $r_{o,t}$ as an occupation-specific completion probability for planning, and compute expected completions implied by starts as:

$$\hat{C}_{o,t} = S_{o,t} \cdot r_{o,t}$$

For steady-state magnitude calculations, if Δ_o denotes an occupational shortfall to be offset (e.g., reduced annual inflows from migration policy), the implied additional starts are approximately:

$$\Delta S_o \approx \frac{\Delta_o}{r_{o,t}}$$

Estimating months-to-train by SOC

Using tables prepared for the DfE's 2025 reform of off-the-job training obligations, which mandate a set minimum of off-the-job training hours for each apprenticeship standard, we construct an estimated duration (months) m_r for a subset of current standards r . We assume, following standard practice, that 20 percent of work hours are used for off-the-job training. We map these durations to SOC codes using the same standard-to-SOC allocation logic.

We define a starts-weighted average months-to-train for SOC o (optionally within level ℓ) as the ratio of starts-weighted months to starts:

$$\text{Months}_{\{t,o,\ell\}} = \frac{\sum_r \sum_{o \in O(r)} \text{Start}_{r,t} \cdot w_{r \rightarrow o}^{\text{SOC}} \cdot m_r}{\sum_r \sum_{o \in O(r)} \text{Start}_{r,t} \cdot w_{r \rightarrow o}^{\text{SOC}}}$$

Because m_r may be missing for some standards, we compute coverage as the share of SOC-allocated starts with an observed months value:

$$\text{Coverage}_{\{t,o,\ell\}} = \frac{\sum(\text{Start}_{r,t} \cdot w_{r \rightarrow o}^{\text{SOC}} \cdot \mathbb{1}[m_r \text{ observed}])}{\sum(\text{Start}_{r,t} \cdot w_{r \rightarrow o}^{\text{SOC}})}$$

Quality assurance

We complete the following quality assurance checks:

- Weight normalisation: for mapped standards, we verify that $\sum_o w_{s \rightarrow o} \approx 1$.
- Mass balance: we compare total mapped starts/achievements/enrolments to raw totals by year, to confirm $\sum_o L_{i,o,t} \approx L_{i,t}$ and $\sum_o A_{i,o,t} \approx A_{i,t}$.
- Unmapped triage: we rank unmapped standards by volume to prioritise additional overrides or mapping fixes. After an initial triage, some unmapped standards were manually updated; a small number, with a low volume of achievements, remain unmapped after standards were retired without replacement.
- Months-to-train coverage: we compute $Coverage_{t,o,i}$ and flag low-coverage SOC codes for cautious interpretation.

Assumptions and limitations

- Where five or fewer individuals start, complete, or are enrolled in a standard in a given year, DfE data shows only 'low'. In our analysis, we take the midpoint of the 1–5 range to assume that every 'low' value represents three people in training. Given the small size of these courses, this approach will as a proportion meaningfully inflate some courses and deflate others, with a meaningful impact on apparent outcomes for small SOC codes.
- Replacement mapping uncertainty for retired standards may introduce classification errors. This is especially the case under one-to-many successor mappings (although this is rare).
- A small number of standards are unmapped due to retirements of apprenticeships without replacements.
- One-to-many standard-to-SOC mappings are approximated with uniform weights, in the absence of better data. (Note that following Skills England's mapping, most apprenticeship standards are mapped to only one SOC code.)
- We apply achievement rates to starts as probabilities for planning. However, they are not the same as same-year achievements-to-starts ratios.
- Our months-to-deliver-training values are scenario-based and may not reflect realised completion times: they assume that 20 percent of work hours are used for the mandated off-the-job training, and that there: (i) are no delays to the completion of an apprenticeship, and (ii) that the trainee is not able to spend a greater proportion of time on off-the-job training (and thus complete faster).
- We extrapolate apprenticeship data for Northern Ireland, Scotland, and Wales based on population proportions. (We do not use the 16–24 age bracket because in 2024/25 more than half of all apprenticeships in England were started by someone 25 years old or over.)⁹

⁹ Department for Education, "Academic year 2024/25: Apprenticeships". <https://explore-education-statistics.service.gov.uk/find-statistics/apprenticeships/2024-25>.

This is unfortunately necessary due to the fact that devolved nations' apprenticeship systems have largely not yet moved from frameworks to standards; as a result occupation-level comparable statistics are not available, making proportional scaling a pragmatic approximation.

- Our analysis focuses on apprenticeship Levels 2 and 3 as a proxy for newly-qualified entrants to the workforce in a given occupation. In some cases, however, this may not capture the full flow of entrants, e.g., where a worker has completed training for an occupation and can move into a related but new occupation without needing to complete a full new apprenticeship.

Visas

Summary

This section of the annex documents our process in preparing a mass-preserving pipeline that (i) converts pre-2024 Q2 sponsored work visa counts coded in SOC2010 into SOC2020 unit groups using a weighted (fractional) crosswalk, and (ii) imputes missing SOC2020 unit group and nationality splits for 2024 Q2–Q3 using observed distributions from donor quarters. All fractional allocations are integerised using row-level Hamilton (largest remainder) rounding, ensuring that relevant row and quarter totals are preserved exactly.

Notation guide

Symbol	Definition
t	Year
q	Quarter
r	Source row
i	SOC2010 unit group
j	SOC2020 unit group
n	Nationality
v	Visa route/type
g	Visa type subgroup
k	Industry
y_r	Observed visa grants (integer) in source row r
$W_{i,j}$	Raw SOC2010→SOC2020 crosswalk weight from i to j
$\hat{W}_{i,j}$	Normalised crosswalk weight (sums to 1 over j for each i)
$x_{r,j}$	Fractional allocation of y_r from SOC2010 $i(r)$ to SOC2020 j
$x_{r,j}^{\text{int}}$	Integerised allocation after Hamilton rounding
R_r	Remainder to distribute in Hamilton rounding for row r
$d_{c,j,n}$	Donor-pool count for conditioning cell c and (j, n) pair
$P_{c,j,n}$	Donor share for conditioning cell c and (j, n) pair

Purpose and output dataset

Our objective is to produce a consistent quarterly panel of sponsored work visa grants that can be analysed at least at the following grain:

- Year and quarter (t, q)
- Visa route/type v and (where available) subgroup g
- Industry k
- SOC2020 unit group j (occupation)
- Nationality n
- Visa grants (integer count)

This process is aimed to fill the 2024 Q2–Q3 gap transparently while preserving the published totals and making assumptions explicit.

Data inputs

The pipeline uses two primary inputs:

- Quarterly sponsored work visa tabulation/microdata extract: a table with quarterly counts by visa type/subgroup, industry and occupation fields. In the Home Office series, SOC and nationality are observed up to 2024 Q1 (SOC2010), missing in 2024 Q2–Q3, and observed again from 2024 Q4 (SOC2020).
- SOC2010→SOC2020 unit-group crosswalk with weights: a mapping table supporting one-to-many and many-to-one conversions, providing the share of each SOC2010 code that corresponds to each SOC2020 code.

Method

Our process occurs over three stages. We first harmonise the 2010 SOC codes up to 2024 Q1 to 2020 SOC codes. We then impute SOC codes and nationality data for 2024 Q2–Q3, where they are missing during a data “break” period in which the Home Office transitioned from 2010 SOC codes to 2020 codes. Finally, we stack and aggregate data across the pre-break, imputed, and post-break periods. All stages are designed to preserve totals exactly.

Harmonising pre-break SOC2010 into SOC2020

We normalise crosswalk weights so they sum to 1 for each SOC2010 code. We conduct this step only for quarters up to and including 2024 Q1.

$$\hat{w}_{i,j} = \frac{w_{i,j}}{\sum_j w_{i,j}}$$

We allocate each source row's count fractionally across SOC2020 destinations using the normalised weights.

Let $i(r)$ be the SOC2010 code on row r . For each destination j in the crosswalk for $i(r)$:

$$x_{r,j} = y_r \cdot \widehat{w}_{i(r),j}$$

We integerise within each original row using Hamilton (largest remainder) rounding.

We compute floors and remainders:

$$a_{r,j} = \text{floor}(x_{r,j})$$

$$\rho_{r,j} = x_{r,j} - a_{r,j}$$

We compute the number of units remaining to allocate:

$$R_r = y_r - \sum_j a_{r,j}$$

Following Hamilton rounding, we assign +1 to the R_r destinations with the largest $\rho_{r,j}$ (using a deterministic tie-break rule, e.g., descending remainder then ascending SOC2020 code).

The integerised allocations are:

$$x_{r,j}^{\text{int}} = a_{r,j} + 1\{j \in \text{TopR}(\rho_{r,j}, R_r)\}$$

The output of this step is that every pre-break source row becomes one or more SOC2020-coded rows with integer counts, inheriting all other attributes (including nationality) from the original row.

Imputing SOC2020 and nationality for 2024 Q2–Q3

In 2024 Q2–Q3, Home Office visa data contains totals by visa type/subgroup and industry, but SOC unit-group and nationality data are missing. We impute a joint SOC2020 \times nationality split for each row during this break period, while preserving the break-row total exactly.

We define the donor pool as all non-break quarters where SOC2020 and nationality are observed:

- Pre-break quarters after the first step (SOC2010 converted to SOC2020; nationality observed).
- Post-break quarters from 2024 Q4 onwards (SOC2020 and nationality observed).

We define conditioning cells and compute donor shares.

For each break-row b , we define a conditioning cell $c(b)$ using covariates still observed in the break data. In the baseline specification, $c(b)$ matches on (visa type v , subgroup g where available, industry k , and quarter q). Within the donor pool, we compute donor counts and shares for each (j, n) :

$$d_{c,j,n} = \sum_{r \in D(c)} Y_r \cdot 1\{SOC2020 = j, Nat = n\}$$

$$p_{c,j,n} = \frac{d_{c,j,n}}{\sum_{j',n'} d_{c,j',n'}}$$

If $\sum_{(j,n)} d_{c,j,n} = 0$ (or donor mass is deemed too small for stability, if donor cells contain too few grants to yield stable shares), we apply hierarchical fallback by dropping the least stable or most granular covariates until a cell with non-zero donor mass is found. The method always uses the most specific feasible cell.

We allocate the break-row total using donor shares, then integerise within the break-row:

$$x_{b,j,n} = y_b \cdot p_{c(b),j,n}$$

We apply Hamilton rounding within the original break-row across all (j, n) pairs to obtain integerised counts $x_{b,j,n}^{\text{int}}$, ensuring $\sum_{j,n} x_{b,j,n}^{\text{int}} = y_b$ exactly.

We flag all records generated in this step as `Imputed = TRUE`. Records outside 2024 Q2–Q3 are flagged `Imputed = FALSE`.

Stacking and aggregating to the analytical output table

We stack three components: (i) pre-break converted rows (`Imputed = FALSE`), (ii) break-quarter imputed rows (`Imputed = TRUE`), and (iii) post-break observed rows (`Imputed = FALSE`). We then aggregate to the minimal analytical grain described in Section 1.

Quality assurance and validation gates

We use the following checks as hard gates, for which failures halt the coded pipeline before export. They provide both error detection and an audit trail.

Mass preservation (quarterly and cell totals)

For each quarter (and for each *quarter* × *visa type* × *subgroup* × *industry* cell), the output total grants must exactly equal the source total. This is guaranteed by construction, but we verify explicitly to guard against merge or filtering errors.

Nationality invariance pre-break

Up to 2024 Q1, nationality is observed. Because we only redistribute counts across SOC2020 destinations within each original row, totals by nationality (holding constant quarter, visa type/subgroup and industry) must be identical before and after conversion. Any non-zero difference indicates a pipeline error.

Break-row invariance (2024 Q2–Q3)

For every break-period source row, the sum of imputed $SOC \times nationality$ child rows must equal the observed break-row total exactly.

Crosswalk coverage and ‘no drop’ rule

If a SOC2010 code is missing from the crosswalk, the record is retained and flagged for review. SOC2020 codes in the output are validated against an allowed universe (the union of crosswalk destinations and post-break observed SOC2020 codes).

Spikes and discontinuities

Where there are large spikes or discontinuities in a $SOC \times nationality \times quarter$ series, we inspect them using a checklist to identify possible processing errors: correct SOC field selection, conversion executed at row-level, no nationality mixing during rounding, and correct donor-cell fallback. Where discontinuities are genuine, they are retained; where they reflect pipeline errors, we correct and document the fix.

Assumptions and limitations

- We assume the validity of the crosswalk, and treat SOC2010→SOC2020 weights obtained from the ONS’ mapping as the best available approximation where mappings are not one-to-one.
- We assume that, within a given visa route/sub-route and industry, the composition of grants across SOC and nationality in 2024 Q2–Q3 is similar to the composition observed in donor quarters. Given that visa policy changed significantly in 2024 (e.g., restrictions on dependents), it is possible that SOC2020 and nationality composition may have changed during the break period.
- We assume donor mass is sufficient; we use hierarchical fallback to ensure non-zero donors, but coarser cells reduce specificity and may smooth genuine changes.

Merging visas with apprenticeships

Overview

This section of the methodology sets out how we convert quarterly sponsored work visa grants to academic-year totals to align with apprenticeship achievements, which are published for academic years (1 August to 31 July). The resulting dataset is a consistent panel at SOC unit-group level, indexed by academic year, containing both (i) annual apprenticeship achievements and (ii) annualised visa grants for the same SOC.

Notation

Table 1 defines the symbols used throughout.

Symbol	Definition
s	SOC unit group (e.g., SOC2020 4-digit).
t	Calendar quarter, $t \in \{YQ1, YQ2, YQ3, YQ4\}$.
Y	Calendar year.
$AY(Y)$	Academic year running from 1 Aug Y to 31 Jul $Y + 1$.
$AYKey(Y)$	Merge key for $AY(Y)$, written following DfE nomenclature as YYYYYY (e.g., $AYKey(2021) = 202122$).
$V_{s,t}$	Visa grants in SOC s during calendar quarter t .
$A_{s,AY}$	Apprenticeship achievements mapped to SOC s during academic year AY .
$w_{t \rightarrow AY}$	Weight equal to the share of quarter t that falls within academic year AY .
$\tilde{V}_{s,AY}$	Visa grants re-expressed on an academic-year basis (weighted sum of quarterly grants).

Academic-year key convention

We index academic years by their start year. For academic year $AY(Y)$ (Aug Y – Jul $Y + 1$), we define a compact merge key:

$$AY\ Key(Y) = 100 \times Y + ((Y + 1) \bmod 100)$$

In practice, this is implemented as a concatenation of the four-digit start year and two-digit end year. For example, $AY(2021)$ corresponds to $AYKey(2021) = 202122$.

Temporal harmonisation of quarterly visa grants

Let $\tilde{V}_{s,AY(Y)}$ denote the visa total for SOC s expressed on an academic-year basis. We allocate quarterly visa grants into academic years using month-overlap weights. We assume that visa grants are uniformly distributed within each quarter, an approximation used in the absence of microdata on grant dates.

Month-overlap weights

Academic year $AY(Y)$ spans: Aug-Sep of year Y (2 months of $YQ3$), Oct-Dec of year Y (all of $YQ4$), Jan-Jun of year $Y + 1$ (all of $(Y + 1) Q1$ and $(Y + 1) Q2$), and Jul of year $Y + 1$ (1 month of $(Y + 1) Q3$). (Note that calendar year $Q3$ is split across adjacent academic years: for academic year $AY(Y/Y + 1)$, $Q3$ of year Y contributes 2/3 (Aug–Sep) and $Q3$ of year $Y + 1$ contributes 1/3 (Jul).) Therefore, with the assumption that the distribution of visas across a given quarter is uniform, the weights are:

Quarter Contributing to $AY(Y)$	Months in $AY(Y)$ /Months in Quarter	Weight $w_{t \rightarrow AY(Y)}$
$YQ3$ (Jul–Sep)	Aug–Sep (2 of 3)	2/3
$YQ4$ (Oct–Dec)	Oct–Dec (3 of 3)	1
$(Y + 1) Q1$ (Jan–Mar)	Jan–Mar (3 of 3)	1
$(Y + 1) Q2$ (Apr–Jun)	Apr–Jun (3 of 3)	1
$(Y + 1) Q3$ (Jul–Sep)	Jul (1 of 3)	1/3

Academic-year visa total

We define weights $w_{t \rightarrow AY}$ as the share of months in calendar quarter t that lie within academic year AY . The academic-year visa total is:

$$\tilde{V}_{s,AY} = \sum_t (w_{t \rightarrow AY} \cdot V_{s,t})$$

Expanding for $AY(Y)$ using the weights above yields:

$$\tilde{V}_{s,AY(Y)} = \left(\frac{2}{3}\right) \cdot V_{s,YQ3} + V_{s,YQ4} + V_{s,(Y+1)Q1} + V_{s,(Y+1)Q2} + \left(\frac{1}{3}\right) \cdot V_{s,(Y+1)Q3}$$

If monthly (or daily) visa grant dates are available, the weighting step should be replaced by exact allocation of each grant date to the relevant academic year.

Aggregation and merge

Construct weighted visa series

For each SOC s and quarter t , we multiply $V_{s,t}$ by the appropriate weight $w_{t \rightarrow AY}$. We then aggregate across all contributing quarters for each academic year:

$$\tilde{V}_{s,AY} = \sum_{t \in T(AY)} (w_{t \rightarrow AY} \cdot V_{s,t})$$

Construct achievements series

We aggregate apprenticeship achievements to $SOC \times AY$ key to obtain $A_{s,AY}$. Where achievements are observed at finer granularity, we apply the SOC mapping first and then sum to the SOC unit-group level for each academic year.

Merge

We merge the two annual series on the pair ($s, AYKey$) to produce a combined panel containing $A_{s,AY}$ and $\tilde{V}_{s,AY}$ for each SOC and academic year.

Rounding and accounting identities

Because $\tilde{V}_{s,AY}$ is constructed using fractional weights, it will generally be non-integer. To preserve accounting identities, we retain fractional values through aggregation and round only after computing SOC \times academic-year totals.

Quality assurance and edge-year treatment

- Mapping completeness: we ensure each ($Year, Quarter$) observation maps to exactly one academic-year key and weight.
- Total consistency: $\sum_{s,AY} \tilde{V}_{s,AY}$ should equal $\sum_{s,t} V_{s,t}$ up to negligible floating-point error.
- SOC consistency: after merging, we check for SOC codes present in one series but not the other (e.g., unmapped standards).

Assumptions and limitations

- To harmonise visa flow (calendar year) data with apprenticeship (academic year) data, we are required to split Q3 across adjacent academic years. In doing so, we assume uniformity across within-quarter timing of visa grants. If there is systematic within-quarter seasonality, the month-overlap weights will introduce measurement error. This error is likely to be small for analyses aggregated across multiple SOCs or multiple years, but may be meaningful for very small SOC-year cells.
- Visa grants are an inflow measure, and apprenticeship achievements capture completions of domestic training programmes, with a lag: a worker will have been contributing in a given occupation for some time before becoming formally qualified. Neither series measures total labour supply in the occupation, and both should be interpreted alongside wider labour-market evidence (vacancies, earnings, employment volumes, and employer surveys).

Estimating the apprenticeship-start uplift required to replace a loss of visas

Overview

For each SOC unit group, we estimate how much the annual apprenticeship starts cohort would need to increase (relative to 2024/25 starts) for the resulting additional apprenticeship completions to replace the annual inflow of workers currently arriving via visas, under a steady-state assumption.

Notation

Symbol	Definition
V_o	Average annual visa grants
S_o	Number of apprenticeship starts in academic year 2024/25
r_o	Apprenticeship completion rate, per 2023/24 data (most recent)

Additional apprenticeship starts required to replace visas

Assuming each visa grant corresponds to one additional worker inflow that must be replaced by a qualified domestic entrant, and that an additional start yields r_o expected completions, the required annual increment in starts is:

$$\Delta S_o = \frac{V_o}{r_o}$$

Increment as a proportion of current starts

To aid interpretation across occupations with different baseline training volumes, we express the required increment as a share of current starts:

$$\% \Delta S_o = \frac{\Delta S_o}{S_o}$$

Interpretation and key assumptions

- We prioritise the use of apprenticeships at Levels 2 and 3, which we assume represent a greater share of new workforce entrants than higher-level apprenticeships, which frequently provide upskilling. Where a SOC code has an inflow of workers from apprenticeships at Levels 2 and 3 and Levels 4+, we only use apprenticeship achievements at Levels 2 and 3. Where a SOC code does not receive apprenticeships from Levels 2 and 3, we then use apprenticeship achievements at higher levels.
- Not all occupations on the MAC's list draw new entrants predominantly from apprenticeships. To aid interpretation, we use a traffic light system based on Skills England's analysis of expected education level by 4-digit SOC code. We classify all mapped occupations into one of three buckets: "Predominantly apprenticeships", when the highest expected education is Level 3; "Mixed pipeline", when the expected education includes low levels but also Levels 4/5 and over; and "Weak apprenticeship proxy", when the expected education is Level 6 and above.
- We assume steady-state replacement for a comparison of annual flows. In reality, apprenticeships have a training lag, and apprenticeship completions would only replace visa flows after a delay.
- We assume that achievement rates would not change if apprenticeship starts increased. In practice, rapid expansion due to the need to fill gaps left by loss of visa access could affect completion rates.

- We assume that visa loss represents an additional workforce gap to be filled. We treat the removal of visa access as reducing annual worker inflows relative to the current equilibrium (in which apprenticeship training volumes have been set with visas available). The calculation therefore estimates the *additional* apprenticeship starts required for extra completions to offset that lost inflow; we do not model changes in underlying labour demand or employers' alternative adjustment margins. We do not, for example, model a scenario in which employers scale down activities rather than investing in domestic training, or in which they instead invest in automation.

Creating a prioritisation index for occupations considered for Skilled Worker visas

Overview

To aid decision-making regarding access to Skilled Worker visas for RQF 3-5 occupations, we create a modular index ranking occupations by the strength of their case for retaining access to the visa route. This is intended to prioritise occupations for which tighter migration policy would be hardest to balance domestically with the timeframe relevant to policy goals, and for which policy goals have greatest need of workers' labour outputs.

We split the index into three elements:

- i) A core visa need score, based on current or near-term indicators;
- ii) A forward pressure module using demand indicators that are modelled or noisier; and
- iii) A multiplier intended to reflect occupations' importance to IS-8 sectors.

We also provide evidence-coverage and workforce-size flags. Where apprenticeship data is missing or apprenticeships are a weak proxy for the flow of domestic new entrants, or where other data is missing (e.g., on wages or total employment), we caution that the index should be viewed with scepticism. Even for occupations for which all data is present, moreover, the index should only be viewed as an indicative input for prioritisation; some unknown quantities, such as the importance of an individual occupation's labour output or the elasticity of a given domestic labour supply channel, could conceivably outweigh all other factors.

Index structure

We summarise the components of the index below. To aid transparency, we keep current labour market evidence, future demand pressures, and strategic policy priorities distinct. Each set of factors can be individually edited in the paper's interactive web-based modelling tool.

Component	Purpose	Default implementation
Core Visa Need Score	Ranks occupations by current reliance on migration and the likely difficulty of replacing that flow domestically in the near to medium term.	Always shown; forms the main ranking.
Forward Pressure Score	Summarises job-advert pressure and modelled future demand, including projected growth and replacement demand.	Starts by default at a low weight.
Strategic Overlay	Applies a modest uplift for breadth of IS-8 relevance and explicit policy emphasis, notably Clean Energy and Defence.	Applied after the evidence score; capped by default.
Evidence-coverage flag	Shows how much of the intended evidence is observed for a given occupation.	Displayed next to each rank.
Small-workforce caution flag	Flags occupations for which very small employment stocks may make ratios unstable or more volatile.	Displayed next to each rank.

Notation

Symbol	Definition
V_i	Average annual Skilled Worker visas for occupation i .
S_i	Average annual apprenticeship starts for occupation i .
C_i	Average annual apprenticeship completions for occupation i .
E_i	Estimated employee job volume for occupation i .
q_i	Trailing average apprenticeship completion rate for occupation i .
L_i	Average apprenticeship duration (months) for occupation i .
W_i	Hourly earnings series for occupation i .
A_i	Job adverts per 100 employee jobs for occupation i .
G_i	Projected occupation growth as a share of employment, 2025–2030.
R_i	Modelled replacement demand as a share of employment, 2025–2030.
N_i	Number of IS-8 sectors to which occupation i is tagged.
CE_i	Indicator equal to 1 if occupation i is tagged as relevant to Clean Energy, 0 otherwise.
DE_i	Indicator equal to 1 if occupation i is tagged as relevant to Defence, 0 otherwise.
α	Increment applied for each additional IS-8 sector beyond the first.
β	Additional uplift for Clean Energy relevance.
γ	Additional uplift for Defence relevance.
M_{max}	Maximum permitted strategic multiplier.

Time windows used

We use different time windows for indicators depending on data availability, summarised below.

Variable Group	Default Window	Reason
Skilled Worker visa grants	Average of 2023/24 and 2024/25.	Reduces one-year noise while keeping the measure current.
Apprenticeship starts	"	"
Apprenticeship completions	"	"
Job adverts	"	"
Starts uplift (ΔS)	Recent two-year average minus earlier two-year average: (2023/24–2024/25)–(2021/22–2022/23).	Measures whether domestic training activity is scaling up.
Completion rate q_i	Trailing average over 2021/22–2023/24.	Uses the most recent years with observed completion-rate data.
Wage pressure	Change in hourly earnings from 2021/22 to 2024/25, relative to the economy-wide change over the same period.	Captures recent tightening without relying on wage levels.
Projected occupation growth	2025–2030	Used by Skills England.
Modelled replacement demand	2025–2030	Used for consistency with occupation growth figures

Creating the “core visa need” score

We place a “core visa need” score at the centre of the index. This is intended to focus primarily on the ability of domestic supply to replace Skilled Worker visas within a policy-relevant timeframe in the event that an occupation is not retained on the MAC’s list.

This subindex comprises the following indicators with the following default weights, editable in the interactive web tool:

- Visa intensity: 20 percent initial weight
- Visa share of observed entrants: 20 percent initial weight
- Shortfall in the apprenticeship response: 20 percent initial weight
- Training lag: 20 percent initial weight
- Relative wage pressure: 20 percent initial weight

Visa intensity

We use visa intensity to express current reliance on non-UK-born workers once total occupation size is considered. Higher values suggest greater reliance on migration. This approach avoids treating the same number of visas as equally important in a small occupation and a very large one.

$$VI_i = 1000 \cdot \frac{V_i}{E_i}$$

Visa share of observed entrants

To capture immediate dependence on migration relative to domestic flows of trained workers into occupations, we compare visas with apprenticeship completions rather than starts. This reflects that apprenticeship completions provide fully qualified workers to employers, like visas, and that in many occupations a high proportion of starts do not remain in an occupation.

$$VS_i = \frac{V_i}{V_i + C_i}$$

Higher values of VS_i imply that a larger share of observed entrant flow is coming through visas rather than domestic apprenticeship completions, and that a rapid domestic response to meet a shortfall is likely to be more challenging.

Responsiveness of the domestic pipeline

To proxy the ability of the domestic training pipeline to respond to the loss of visa access, we first consider whether the domestic training pipeline appears to be expanding in the current context. We first calculate the recent uplift in starts (2023/24–2024/25) relative to an earlier comparison period (2021/22–2022/23):

$$\Delta S_i = \max(0, S_i^R - S_i^E)$$

We then adjust this uplift for the expected completion rate (using averages of 2021/22–2023/24 data, the most recent available) and the time needed to complete training, to produce an adjusted response ratio:

$$AR_i = \frac{\Delta S_i \cdot q_i \cdot \frac{12}{L_i}}{V_i + \varepsilon}$$

where $\varepsilon = 1$.

This ratio is intended to approximate the additional annual domestic inflow of trained workers that will eventually be generated by the recent increase in starts, relative to current visa inflows. If AR_i is higher it is to be expected that the occupation has less visa need, because a stronger domestic training response is anticipated. For that reason, we reverse-code this response measure at the scoring stage, so that a weaker domestic training response produces a higher visa-need score.

Training lag

Even where the domestic training pipeline is functioning, the speed at which additional domestic supply of trained workers will be produced varies across apprenticeships. Some apprenticeship pathways take a long time to complete, and domestic response to the loss of visas may thus struggle

to produce trained workers within a policy-relevant timeframe. To reflect this we use a training-lag component that uses occupation-level apprenticeship duration:

$$TL_i = L_i$$

A higher value of TL_i implies greater near-term dependence on visas, because domestic substitution would take longer. It should be noted here, however, that this assumes that the occupation's labour output is strategically important: if a worker shortfall can be tolerated while hoping or expecting that domestic supply will catch up, the calculus will of course be different.

Wage pressure

We include recent wage pressure as a reflection of current labour supply availability. To do so we use excess hourly wage growth relative to the economy-wide change, rather than wage levels themselves:

$$WG_i = [\ln(W_{i,1}) - \ln(W_{i,0})] - [\ln(W_{UK,1}) - \ln(W_{UK,0})]$$

Higher values of WG_i indicate that occupation-specific wages are rising faster than the national benchmark, which can be interpreted as evidence of a tighter labour market.

Standardisation across indicators

Because the raw indicators are expressed in different units, we convert them to percentile scores. Let $P_i(x)$ denote the percentile score of occupation i on indicator x . The response indicator is the only one reversed (because higher raw values of AR_i suggest less rather than more visa need).

Formula	Indicator Score
$(s_i(VI) = P_i(VI))$	Visa intensity score
$(s_i(VS) = P_i(VS))$	Visa share score
$(s_i(AR) = 100 - \min(100, P_i(AR)))$	Response shortfall score
$(s_i(TL) = P_i(TL))$	Training lag score
$(s_i(WG) = P_i(WG))$	Wage pressure score

Aggregation

We calculate the core visa need score as the weighted mean of the *available* core indicator scores:

$$Core_i = \frac{\sum_k (\omega_k S_{ik})}{\sum_k \omega_k}$$

This means that the denominator is taken only over indicators that are both included and observed for occupation i . We renormalise weights across non-missing active indicators rather than treating missing data as zero.

Missing data and evidence coverage

We report evidence coverage separately, so that occupations with missing data can remain visible in the index tool without being treated as equally well evidenced as occupations with better coverage. In particular, we caution that missing apprenticeship data should not necessarily be read as evidence of weak domestic supply: several occupations are unmapped by Skills England, and thus drop out.

$$Evidence\ Coverage_i = \frac{\Sigma(\text{default weights for observed and included core indicators})}{\Sigma(\text{all default core weights})}$$

The core visa need score should thus be considered alongside evidence coverage and small-workforce flags.

Incorporating forward demand pressure

The core visa need subindex primarily concerns labour supply, for which we have better data availability. The final index also includes a module covering forward pressure from labour demand due to occupation growth and replacement needs. Because data reliability for these indicators is less good than for the core visa need subindex, we give less weight to the forward pressure module.

The forward pressure module contains the following indicators, with base weighting as follows but editable in the interactive tool:

- Job adverts: 33.33 percent initial weight
- Projected growth: 33.33 percent initial weight
- Modelled replacement demand: 33.33 percent initial weight

These are all raw indicators.

Standardisation and aggregation

We convert each raw forward indicator to a 0–100 score using the same rank-based percentile approach as for the core indicators:

$$s_1(A) = r_1(A)$$

$$s_1(G) = r_1(G)$$

$$s_1(R) = r_1(R)$$

By default, the forward pressure score is the weighted mean of the active and observed forward-pressure scores, with weights renormalised across any indicators that are included and not missing. Let FP_i be the forward pressure score for occupation i ; d_k be the inclusion or weight term

for indicator k ; and $1(\text{observed } s_{ik})$ be an indicator function equal to 1 when that score exists for occupation i , and 0 when it is missing:

$$FP_i = \frac{\sum_k [d_k \cdot 1(\text{observed } s_{ik}) \cdot s_{ik}]}{\sum_k [d_k \cdot 1(\text{observed } s_{ik})]}, \quad k \in \{A, G, R\}$$

If no forward indicator is both active and observed for occupation i , the forward pressure score is left blank.

Blending the core visa need and forward pressure scores

We use the forward pressure module to affect the overall evidence score through the blending parameter λ . This preserves the core visa need score as the anchor of the framework, while allowing users to test how rankings change when more weight is given to forward pressure evidence via the interactive tool:

$$\text{Evidence Score}_i = (1 - \lambda) \cdot \text{Core}_i + \lambda \cdot FP_i$$

We set λ by default to 0.15 because the set of indicators in the forward pressure module are less reliable than those in the core visa need subindex. If FP_i is blank because no forward indicator is active or observed, the evidence score defaults to the core visa need score.

Applying a strategic priority multiplier

Recognising that policy priorities are not captured fully by occupation-level labour market indicators alone, and that the labour outputs from some sectors and occupations will be more strategically important than those of others, we include a multiplier intended to adjust occupations' scores according to apparent and subjective output importance. We bound the multiplier, applying it after the evidence score has been calculated. The multiplier is on by default, but can be untoggled in the interactive index tool.

Constructing the multiplier

We calculate the multiplier as the capped sum of a base value of 1; a breadth increment for each additional IS-8 sector beyond the first; and uplifts if the occupation is tagged as relevant to chosen IS-8 sectors. In the base index we give an uplift to the Defence and Clean Energy sectors, assuming that current policy will prioritise these areas; uplifts can be edited in the interactive index tool.

$$M_i = \min[M_{max}, 1 + \alpha \cdot \max(0, N_i - 1) + \beta \cdot CE_i + \gamma \cdot DEF_i]$$

By default the strategic priority multiplier is switched on, with $\alpha = 0.03$, $\beta = 0.07$, $\gamma = 0.07$, and $M_{max} = 1.25$. These can all be adjusted to model an index operating under different policy priorities. If the overlay is switched off, M_i is set to 1.

We then apply the multiplier to the evidence score to produce the final score by which occupations are ranked:

$$FinalPriority_i = EvidenceScore_i \cdot M_i$$

The default cap to the multiplier, set at 1.25, allows it to affect rankings at the margin but not to entirely dominate the evidence score.

Approaches to missing data, evidence coverage, and ranking rules

Treatment rules

To avoid dropping occupations for which elements of the index rely on unavailable data, we use omission and renormalisation rather than zero-imputation. We handle missing data, including sparse apprenticeship evidence, as follows:

Issue	Treatment	Reason
A core indicator is missing	We omit that indicator from the weighted average and automatically renormalise the remaining observed core weights.	Avoids incorrectly treating missing data as evidence of low or high visa need.
An occupation is a weak apprenticeship proxy	The occupation is flagged. If apprenticeship-based indicators are blank, they will drop out of the core score mechanically.	Prevents apprenticeship gaps from being misread as true absence of domestic supply.
A forward indicator is missing or toggled off	That indicator is excluded from the Forward Pressure Score.	Avoids forced imputation.
No forward indicators are both active and observed	The Forward Pressure Score is blank and the Evidence Score reverts to the Core Visa Need Score.	Prevents artificial dilution of the core score.
Evidence coverage falls below the minimum threshold	Scores may still be displayed, but the occupation is by default excluded from the ranked list (although users can toggle their visibility if wished).	Prevents thin-evidence occupations from being over-interpreted in ordinal rankings.

Evidence coverage

We report evidence coverage separately to allow users to see how much of the potential core evidence base is actually observed for each occupation. Coverage is the share of total current core weight that is attached to observed core indicators:

$$Coverage_i = \frac{\sum_k [\omega_k \cdot 1(\text{observed } s_{ik})]}{\sum_k \omega_k}$$

Coverage is a function of both data availability and the weighting scheme in use. This means that evidence coverage will change if users alter the core indicator weights using the interactive index tool.

Coverage bands and ranking treatment

We translate the coverage measure into interpretation bands, and use the minimum-coverage threshold to determine whether an occupation is ranked.

Condition	Displayed Band	Ranking Treatment
$Coverage_i \geq 0.80$	High	Included in ranking.
$0.50 \leq Coverage_i < 0.80$	Medium	Included in ranking.
$Coverage_i < 0.50$, or no valid core score	Low	Unranked unless toggled.

We then rank occupations meeting the evidence-coverage threshold by final score:

$$CoreRank_i = 1 + count_j(Core_j > Core_i \text{ and } Coverage_j \geq \theta)$$

$$FinalRank_i = 1 + count_j(FinalPriority_j > FinalPriority_i \text{ and } Coverage_j \geq \theta)$$

By default, the minimum threshold θ is 0.50.

Small workforce caution flag

We display a small-workforce caution flag for occupations with fewer than 10,000 employee jobs, following practice by the DfE. This flag does not change the score: it signals that occupations with a small total of employee jobs may mechanically see more volatility indicators using proportional measures, and that their results should be interpreted with a greater degree of caution.

$$Small\ Work\ force\ Flag_i = 1(E_i < 10,000)$$

Index implementation defaults

The index tool is parameterised to allow users to make adjustments, but we use the settings shown below as defaults.

Parameter	Default Value	Module	Operational Effect
Visa intensity	0.2	Core visa need	Always on; default even weights across core visa need subindex.
Visa share of entrants	0.2	Core visa need	Always on; default even weights across core visa need subindex.
Domestic pipeline response	0.2	Core visa need	Always on; default even weights across core visa need subindex.
Training duration	0.2	Core visa need	Always on; default even weights across core visa need subindex.
Wage pressure	0.2	Core visa need	Always on; default even weights across core visa need subindex.
λ (forward pressure weight)	0.15	Forward Pressure	Leaves the evidence score equal to the core score unless the user activates forward pressure.
Job adverts included?	1	Forward Pressure	Adverts are on by default.

(Continued)

Parameter	Default Value	Module	Operational Effect
Projected growth included?	1	Forward Pressure	Projected growth is on by default.
Projected replacement demand included?	1	Forward Pressure	Projected replacement demand is on by default.
Overlay on?	1	Strategic overlay	Strategic priority multiplier is on by default.
IS-8 breadth increment α	0.03	Strategic overlay	Adds a small uplift for each additional IS-8 sector beyond the first.
Clean Energy uplift β	0.07	Strategic overlay	Adds an additional uplift for Clean Energy relevance.
Defence uplift γ	0.07	Strategic overlay	Adds an additional uplift for Defence relevance.
Maximum multiplier cap M_{max}	1.25	Strategic overlay	Caps the multiplier so strategic relevance cannot dominate the score.
ε (division-safety constant)	1	Technical	Prevents division by zero in the response-ratio calculation inherited from the core score.
Minimum evidence coverage θ	0.50	Ranking rules	Suppresses ranks for occupations with insufficient observed core evidence.
Small workforce threshold	<10,000 employee jobs	Interpretation flag	Adds a caution flag without altering the score.

Sensitivity checking the index

Because the index is composite, rankings are necessarily affected by modelling choices regarding component inclusion, weighting, and strategic prioritisation on the basis of policy needs. We therefore test the index's sensitivity to different plausible weighting or component inclusion choices by varying composition across six scenarios. These scenarios are chosen to test three contestable parts of the framework: the inclusion of noisier forward-looking demand indicators; the use of strategic policy uplifts; and the contribution of wage pressure, a noisy demand-side indicator, within the core score.

- **Baseline:** the default scenario.
- **Core visa need only:** the default scenario with both the forward pressure module and the strategic multiplier removed.
- **Forward pressure module off:** removes job advert intensity, projected increase in total employee demand, and modelled replacement demand.
- **Strategic multiplier off:** sector breadth and sector-specific multipliers are removed.
- **Sector-specific uplifts off:** sector breadth in the strategic multiplier is retained, but sector-specific multipliers are removed.
- **Wage pressure removed:** drops wage pressure from the core indicators, to focus on raw supply and test without a potentially noisy variable.

The sensitivity results indicate that the index is robust for identifying broad bands of occupations by their need to maintain access to visas, but that changes to component choice and weighting introduce sufficient volatility that individual rankings and scores are less robust. This is a normal result for a composite index.

In the table below we show the headline results of the sensitivity analysis. We include mean and median results, as well as changes at the top-20 and top-40 (roughly 25 percent and 50 percent) occupational cuts. We report Spearman rank correlation (calculated only on occupations ranked in both scenarios: if an occupation becomes unranked due to changes in evidence coverage between scenarios we do not include them).

	Mean Absolute Rank Change	Median Absolute Rank Change	Share of Baseline Top 20 Retained	Number Leaving Top 20	Share of Baseline Top 40 Retained	Number Leaving Top 40	Largest Drop Among Baseline Top 10	Largest Drop Among Baseline Top 20	Rank Correlation with Baseline
Baseline	0	0	100%	0	100%	0	0	0	1
Core visa need only	4.625	3	75%	5	95%	2	4	12	0.941
Forward pressure module off	3.19	2	85%	3	95%	2	2	12	0.970
Strategic multiplier off	3.31	2	90%	2	98%	1	8	16	0.968
Sector-specific uplifts off	1.97	1.5	95%	1	100%	0	2	8	0.990
Wage pressure removed	5.13	4	90%	2	93%	3	12	17	0.935

The largest changes happen with the use of core visa need only, and with the removal of the wage pressure component. Even with these changes, rank correlation with the baseline remains high (0.935–0.990), and between 75 and 95 percent of the baseline top 20 occupations remain in the top 20. The index therefore appears reasonably robust for identifying a broad priority group, although the exact ordering within that group is more sensitive to specification choices.

In the table below we show the results of the sensitivity analysis for the top 20 occupations in the default implementation of the index, showing ranks across scenarios and rank changes versus the default implementation. Positive rank change values indicate an occupation moves up the ranking relative to baseline; negative values indicate it moves down. The top occupations are relatively stable across scenarios, while some mid-ranked occupations move more.

SOC	Occupation	Baseline		Core Visa Need Only		Forward Pressure Module Off		Strategic Multiplier Off		Sector-Specific Uplifts Off		Wage Pressure Removed	
		Rank	Rank Change	Rank	Rank Change	Rank	Rank Change	Rank	Rank Change	Rank	Rank Change	Rank	Rank Change
5212	Metal plate workers, smiths, moulders and related occupations	1	0	1	0	1	0	1	0	1	0	1	0
3512	Ship and hovercraft officers	2	0	2	0	2	0	2	0	2	0	2	0
5319	Construction and building trades n.e.c.	3	0	3	0	3	0	3	0	3	0	6	-3
5322	Floorers and wall tilers	4	0	4	0	4	0	4	0	4	0	4	0
5213	Welding Trades	5	0	8	0	5	0	13	-8	7	6	11	-4
5242	Telecoms and related network installers and repairers	6	0	6	-2	8	-2	5	3	5	0	9	-4
3581	Inspectors of standards and regulations	7	0	10	-2	9	-2	9	0	6	3	19	-13
5249	Electrical and electronic trades n.e.c.	8	0	5	2	6	2	6	0	8	-2	10	-2
3417	Photographers, audio-visual and broadcasting equipment operators	9	0	13	-2	11	-2	8	3	9	-1	18	-9
3115	Quality assurance technicians	10	0	11	3	7	3	15	-8	10	5	5	5
5316	Carpenters and joiners	11	0	16	-6	17	-6	11	6	11	0	16	-5
5312	Stonemasons and related trades	12	0	19	-4	16	-4	14	2	13	1	3	10
3120	CAD, drawing and architectural technicians	13	0	21	0	13	0	18	-5	14	4	8	6
3113	Engineering technicians	14	0	26	2	12	2	30	-18	22	8	14	8
5313	Bricklayers	15	0	22	-3	18	-3	16	2	17	-1	7	10
3429	Design occupations n.e.c.	16	0	15	6	10	6	21	-11	18	3	33	-15
5214	Pipe fitters	17	0	25	-4	21	-4	17	4	19	-2	15	4
3133	Database administrators and web content technicians	18	0	9	-2	20	-2	7	13	12	-5	20	-8
5321	Plasterers	19	0	30	-12	31	-12	19	12	20	-1	13	7
5323	Painters and decorators	20	0	14	-3	23	-3	10	13	15	-5	28	-13

Methodology: Sources

Data	Source	Link
Apprenticeship achievement rates by standard	Department for Education	https://explore-education-statistics.service.gov.uk/data-tables/fast-track/0b61073d-6bd4-4d23-c43b-08dd5d5cc977?featuredTable=true
Apprenticeship data to 2024–2025	Department for Education	https://explore-education-statistics.service.gov.uk/find-statistics/apprenticeships/2024-25
Apprenticeship durations	Department for Education	https://www.gov.uk/government/publications/apprenticeship-funding-rules-2025-to-2026
Apprenticeship versions updates	Department for Education	https://submit-learner-data.service.gov.uk/find-a-learning-aim/DownloadData
Modelled replacement demand by 4–digit SOC2020	Department for Education	https://www.gov.uk/government/publications/labour-market-and-skills-projections-2020-to-2035
Visa data to 2024–2025	Home Office	https://www.gov.uk/government/statistical-data-sets/immigration-system-statistics-data-tables#entry-clearance-visas-granted-outside-the-uk
Population estimates for apprenticeship extrapolation	Office of National Statistics	https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates
SOC2010 to 2020 crosswalk	Office of National Statistics	https://www.ons.gov.uk/methodology/classificationsandstandards/standardoccupationalclassificationsoc/soc2020/therelationshipbetweenstandardoccupationalclassification2010andstandardoccupationalclassification2020
Job advert intensity and earnings by 4–digit SOC2020	Migration Advisory Committee	https://www.gov.uk/government/calls-for-evidence/temporary-shortage-list-review-stage-2
Total employment by 4–digit SOC2020	Migration Advisory Committee	https://www.gov.uk/government/calls-for-evidence/temporary-shortage-list-review-stage-2
Apprenticeship standard to 4–digit SOC2020 mapping	Skills England	https://occupational-maps.skillsengland.education.gov.uk/
Expected education level by 4–digit SOC2020	Skills England	https://www.gov.uk/government/publications/assessment-of-priority-skills-to-2030/assessment-of-priority-skills-to-2030
Projected employment increase to 2030 for priority occupations	Skills England	https://www.gov.uk/government/publications/assessment-of-priority-skills-to-2030/assessment-of-priority-skills-to-2030