



## Skilled Immigrants: Skills That Promote Innovation

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While the contribution of skilled immigrant workers to innovation has been well documented in many countries, there is still lack of evidence for France. We show that, when innovation is measured by the number of patents filed by firms, an increase of one percentage point in the share of skilled immigrant workforce in a French department allows firms in that department to file 5.2% more patents. This phenomenon is explained by a reallocation of native workers across different tasks rather than a replacement of national workers by immigrants. This result provides an additional argument for France to make progress on a skilled immigration policy.

In France, the immigration bill that was presented to the Council of Ministers on February 1 and then discussed by the Senate in March, before being postponed until next fall, had two main parts: a security part and an integration part. In the latter, two main subjects were discussed: the first aimed at addressing labor shortages in sectors under strain, the second focused on attracting skilled immigrants. Indeed, part of this governmental project is aimed at making France more attractive to foreign professionals. To this end, several administrative simplification measures are proposed, such as (i) changing the name of the residence permit from “talent passport” to “talent” (but keeping unchanged the eligibility criteria), (ii) merging the three categories of the “talent passport” related to business creation and investment (*i.e.* “business creation”, “innovative economic project” and “investment in France”) into a single title, “talent project carrier”, and (iii) creating a specific residence permit in the health sector, “talent – medical and pharmaceutical professions”. As stated in the introduction of the law proposal,

the immigration of highly qualified professionals is considered “crucial to the dynamism of our economy”.

Indeed, skilled immigration has been identified by many studies as an important driver of economic growth for many developed countries. However, no research has been conducted so far on the specific case of France. Do skilled immigrants in France promote innovation? Is it at the expense of the native population?

### ■ Skilled immigration a passport for growth

Immigration can increase productivity, and thus growth, through channels such as knowledge diffusion, birthplace diversity, and innovation. For example, Bahar and Rapoport (2018) show the existence of a phenomenon of knowledge transfer between immigrant and native workers in the host country, leading to the development of skills in new areas

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and an increase in productivity.<sup>1</sup> The diversity of birthplaces drives productivity growth, but also export competitiveness.<sup>2</sup> This is because people from different countries bring with them a more diverse set of skills, experiences, ideas, knowledge and problem-solving abilities. This diversity of skills, as if workers from different countries were factors of production with different and complementary characteristics, improves production efficiency and the overall performance of firms at destination. The ability of skilled immigrants to foster innovation in host countries is another factor boosting economic growth. To date, most work on the impact of immigration on patent production has focused on the United States. This has shown a positive relationship between immigration, innovation and growth: between 1965 and 2010, immigration to the United States would have led to an additional increase of 8% in patents per capita and 5% in wages and output per worker, compared to what would have happened in the absence of increased migration flows following the National Immigration Act of 1965.<sup>3</sup>

The study by Hunt and Gauthier-Loiselle (2010) also shows that immigrants with higher education have a positive impact on innovation, *i.e.* on the number of patents filed by companies in the regions where they work. Interestingly, Hunt and Gauthier-Loiselle (2010) specify the reason why skilled immigrants contribute to boosting innovation: the proportion of scientific degrees, whether in engineering, science, technology or mathematics, is higher among immigrants than among natives.<sup>4</sup>

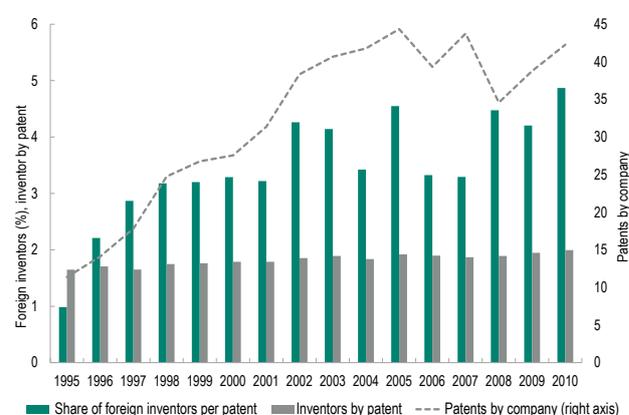
More recently, Beerli *et al.* (2021), using Swiss data, study the impact of the 2004 reform allowing European cross-border workers free access to the Swiss labor market, and show that high-skilled workers increased innovation in firms, particularly in border firms, without harming the employment or wages of Swiss professionals.<sup>5</sup> Since the policy in Switzerland of free movement of persons has led to an increase in the inflow of tertiary-educated cross-border workers relative to those with lower qualifications, the traditional model would suggest that this could have a negative impact on the wages and employment of highly skilled natives. Interestingly, Beerli *et al.* (2021) find the opposite: a positive effect on the real wages of highly educated natives, starting in the transition period and increasing to as much as +4.5% during the free-movement period. Also, the study excludes the possibility of significant negative effects on employment, and shows a complementarity that benefits all workers, rejecting the hypothesis of a substitution effect between native and immigrant workers.

## ■ In France too, skilled immigrants stimulate innovation

So far, the impact of skilled immigration on innovation in France has not been studied. However, between 1995 and 2010, the number of patents per manufacturing firm increased by a factor of 3.7, from 11.3 to 42.3 (Figure 1). At the same time, the share of foreign inventors in research teams increased from less than 1% to almost 5% of the total number of researchers, although the average team size remained stable.

Graph 1 – More diversified and productive research teams in the manufacturing sector

Number of inventors per patent, share of foreign inventors in research teams, and number of patents per company in France



Sources: Authors' calculations from INSEE, Annual Declaration of Social Data (DADS) and Orbis.

This is a first indication that, in France too, an increase in the proportion of skilled immigrants boosts innovation. However, to confirm this interesting qualitative evidence, it is necessary to go beyond mere correlation and rule out other confounding factors that may imply spurious correlation, such as the geographical distribution of industrial specializations or skills. These elements could influence both the share of skilled immigrants in employment (by attracting more skilled immigrants) and the number of patents filed (for example, due to increased business productivity), thus creating a potentially misleading correlation between the share of skilled immigrants in employment and the capacity to innovate. When this is done, we uncover a strong positive relationship between the increase in the share of skilled immigrant workers in total employment in a *département* and innovation in the manufacturing firms located there: a 1 percentage point increase in the share of skilled immigrant workers

1. Bahar, D. & Rapoport, H. (2018). Migration, knowledge diffusion and the comparative advantage of nations. *The Economic Journal*, vol. 128(612), 273-305.

2. Alesina, A., Harnoss, J. & Rapoport, H. (2016). *Birthplace Diversity and Economic Prosperity*. *Journal of Economic Growth*, vol. 21(2), 101-138. Orefice, G., Rapoport, H. & Santoni, G. (2021). *How Do Immigrants Promote Exports?* *CEPII Working Paper*, n° 2021-06.

3. Burchardi, K. B., Chaney, T., Hassan, T.A., Tarquinio, L. & Terry, S. J. (2020). *Immigration, Innovation and Growth*. National Bureau of Economic Research, *Working Papers*, 27075.

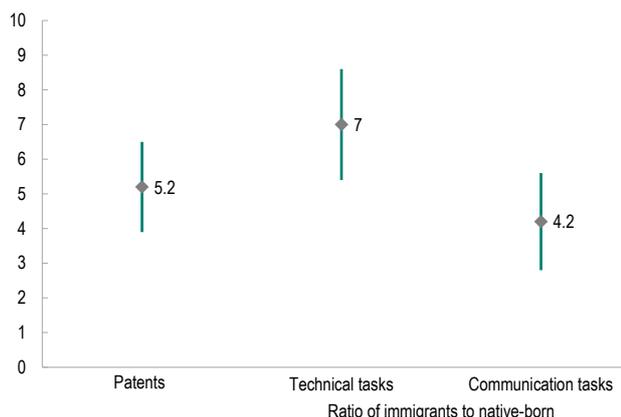
4. Hunt, J. & Gauthier-Loiselle, M. (2010). *How Much Does Immigration Boost Innovation?* *American Economic Journal: Macroeconomics*, vol. 2(2), 31-56.

5. Beerli, A., Ruffner, J., Siegenthaler, M. & Peri, G. (2021). *The Abolition of Immigration Restrictions and the Performance of Firms and Workers: Evidence from Switzerland*. *American Economic Review*, vol. 111(3), 976-1012.

(corresponding to an increase from 1.9% to 2.9% of the share of skilled immigrant workers for an “average” département<sup>6</sup>) induces an average increase of 5.2% in patents per firm (corresponding to 0.41 patents for an “average” firm) – see Figure 2. This increase reaches 7.6% for firms whose capital per employee is in the top 25%.

Graph 2 – Skilled foreign workers help increase the number of patents by being allocated more to technical jobs

Effect of a 1 percentage point increase in skilled immigrant workers in a department on the number of patents filed by department companies and their share in technical and communication tasks



Source: Mayda *et al.* (2022).

The contribution of immigrants to the increase in patent applications is not the result of a substitution effect, *i.e.* the replacement of native workers by immigrants, but of a reallocation of tasks within firms that reflects the comparative advantages of skilled immigrant and native workers. Theoretically, if this task reallocation mechanism is at work, when the supply of skilled immigrant workers in a department increases, employers should increase the immigrant-native ratio more in technical jobs than in communication-intensive jobs, assuming, as is quite likely, that skilled immigrant workers have a comparative advantage in technical tasks compared to natives who are relatively more efficient in communication activities.<sup>7</sup>

Indeed, this is what we observe: a 1 percentage point increase in the share of skilled immigrants in a department raises the immigrant-to-native ratio in both high-technical and high-communication intensity jobs, but more in the former, 7%, than in the latter, 4.2% (Figure 2). Thus, high-skilled immigrant workers concentrate on technical tasks with high research intensity, while high-skilled natives concentrate on management tasks with high communication intensity, where

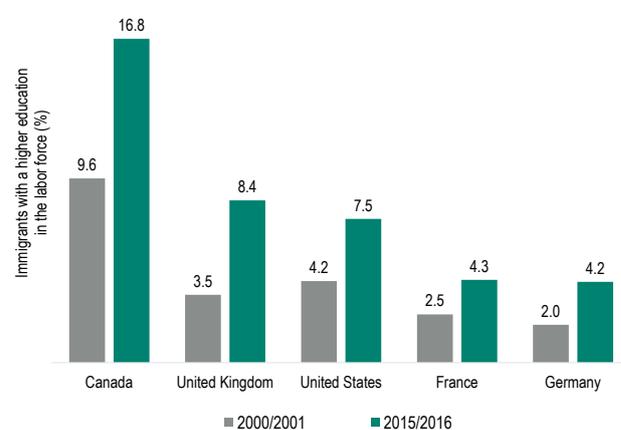
the latter are relatively more productive (mainly due to a better mastery of the language and the institutional landscape).<sup>8</sup>

## How to attract more skilled immigrants

While skilled immigration is a source of innovation, as just discussed, its importance in total employment in France is relatively low compared to other developed countries such as Canada, the United States and the United Kingdom. The share of immigrants with a tertiary degree in employment almost doubled between 2000 and 2016, rising from 2.5% to 4.3%, but it remains well below that of the US (7.5%), the UK (8.4%), and especially Canada, which reaches almost 17% (Figure 3).<sup>9</sup>

Graph 3 – The share of skilled immigrants in employment is low in France

Share of immigrants in employment with higher-education diplomas



Sources: Authors' calculations based on: OECD, Database on Immigrants in OECD and Non-OECD Countries, and Penn World Tables (version 10).

The success of Canada, the US and the UK in attracting high-skilled immigrants did not happen by chance. Policy matters. In Canada and, since 2006, in the UK, a points system allows the selection of immigration candidates based on several criteria, such as age, level of qualification, language skills and work experience.<sup>10</sup> In this way, each applicant receives a score that reflects the match between their characteristics and the priorities of the host government, and does not depend on a prior job offer. In the United States, immigration legislation offers skilled foreigners the opportunity to become legal permanent residents by granting the famous green card through a policy of “employment-based preferential immigration” reserved for foreigner workers recognized for

6. A hypothetical department exactly at the mean of the skilled immigrant employment share distribution.

7. For a description of the underlying theoretical model, Mayda, M., Orifce, G. & Santoni, G. (2022). *Skilled Immigration, Task Allocation and the Innovation of Firms*. CEPII Working Paper, n° 2022-11.

8. Technically intensive occupations include those in PCS 47 (technicians) and PCS 38 (engineers and technical managers). Jobs in PCS 37 (business administration and sales) are considered communication-intensive. Finally, PCS 23 (managers of industrial or commercial enterprises with 10 or more employees), 35 (information professionals), 37 (administrative and commercial managers), 46 (intermediate administrative and commercial managers), and 62-65 (skilled workers) are considered as other skilled occupations.

9. 2016 is the last year for which data are available for international comparison.

10. On this subject, see Auriol, E. & Rapoport, H. (2021). *L'immigration qualifiée : un visa pour la croissance*. Les notes du conseil d'analyse économique, n°67.

their extremely valuable ability in the fields of science, the arts, education or business (professors, researchers, high-level managers, etc).

Conversely, in France, the eligibility criteria for the “talent passport” appear to be more restrictive for non-European workers. Depending on the situation of the applicant, it is systematically necessary to be able to present a previous employment contract with a minimum level of remuneration.<sup>11</sup> For example, a foreigner applying as a “highly qualified” worker has to show (i) a diploma certifying at least three years of higher education or five years of comparable professional experience, (ii) an employment contract of at least one year in France, and (iii) an annual gross salary of more than 53,836.50 euros.

In addition to their policies on skilled workers, countries such as Canada and the United States have policies aimed at retaining foreign students who have graduated from their universities. In Canada, a foreign student can benefit from a temporary residence permit for 36 months after graduation in order to find a job. In contrast, in France the transition from graduation to employment is a major challenge for international students. Individuals holding a professional bachelor’s or master’s degree can obtain a visa subject to an employment contract related to their training and a gross monthly salary of at least 2,331.88 euros for master’s degrees, or a “talent passport” with an employment contract of more than three months and a salary of at least 37,310 euros gross per year. These criteria are likely hard to meet and constitute an obstacle for many young graduates in finding a permanent job in France. Indeed, statistics from the General Directorate for Foreigners

in France (DGEF), cited in Auriol and Rapoport (2021), show that, after five years, only 21% of the 70,000 foreign students who received their first residence permit in 2015 remained in France for economic reasons, while 57% left the country.<sup>12</sup>

However, the scenario for talented international workers has been rapidly changing in recent years. According to a recent OECD report on the attractiveness of international talent, France has made progress in certain areas.<sup>13</sup> The OECD’s attractiveness indicator shows that France’s attractiveness improved for skilled workers between 2019 and 2023, thanks in particular to a fall in visa refusal rates. In addition, the United States and Canada, which had previously been among the best-ranked countries, have experienced a decline in their international rankings in this area due to high refusal rates for highly skilled workers (US) and visa processing times (Canada). But the situation is still problematic for international students in France. Despite the presence of several prestigious universities in France, the introduction of higher tuition fees for foreign students has significantly reduced France’s attractiveness for this category of talent. This has created a gap between the fees charged to foreign and domestic students, affecting France’s position in the OECD’s student talent indicators ranking.

All in all, although France has made progress since 2019 in attracting highly skilled workers, challenges remain, particularly in attracting international students, but especially in enabling them to integrate quickly into the national labor market. This has important policy implications because skilled immigration is a key driver of innovation in France, in particular by increasing the ability to file patents.

11. [service-public.fr](http://service-public.fr)

12. Auriol, E. & Rapoport, H. (2021) *op. cit*

13. OECD (2023). *What Is the Best Country for Global Talents in the OECD? Migration Policy Debates*, n° 29.

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