Labour Market Mismatch in Quebec

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Abstract

We explore the extent of mismatch between job seekers and vacancies in Quebec. Mismatch may occur when those seeking jobs are concentrated in segments of the labour market, e.g. industries, with low job finding probabilities. Job finding probabilities might be low in some segments of the labour market because employers open few positions or because it is difficult to match employers and employees in these segments. Mismatch reduces the job finding rate and increases unemployment. In Quebec, unemployment has recently begun to rise and reached 6.3% in June 2025. In such situations, when the labour market softens, the policy discourse tends to focus on mismatch as one possible explanation. Mismatch in Quebec has increased between 2016 and 2025. This increase is however small compared to the overall level of unemployment. Much of the increase in mismatch results from an increase in the share of vacancies posted in health and social services that is not matched by an equivalent increase in job seekers in this sector.

Mismatch arises when too many job seekers are searching in sectors of the economy in which the probability of finding a job is low, either because there are few vacancies posted or because frictions in this industry make it difficult to match job seekers to open vacancies. For this report, we explore industrial mismatch between job seekers and job vacancies.[1] As an illustration, Figure 1 shows the share of unemployed and of vacancies for selected major industries. The share of job seekers in accommodation and food services is close to the share of vacancies in that industry, but this is not the case in others. For example, job seekers significantly outnumber vacancies in the construction and wholesale & retail industries, whereas the opposite is the case in the healthcare sector. This suggests mismatch.

In this report, we measure the impact of this type of mismatch on unemployment in Québec. To do so, we first estimate how hires are "produced", as a function of job seekers and vacancies, across industries and provinces in Canada. Based on these estimates, we compute the allocation of job seekers across Québec industries that would give rise to the highest job-finding rate, and thus the lowest unemployment rate. We then compute an index that shows how much deviations from this benchmark have contributed to higher unemployment. Finally, we discuss the contribution of different industries to overall mismatch.

Our findings suggest that on average over time, mismatch across major industries reduces monthly hires by about 6% between 2015 and 2017 but has since increased to about 11%.[2] Most mismatch stems from just five

[1] Due to data limitation, we unfortunately cannot examine mismatch at the occupation level, as there are no publicly available data on vacancies by occupation in Canada. Companies such as Lightcast provide proprietary datasets based on scraping online job postings, which might be useful for extending our analysis. However, this data is currently not available for a sufficiently long time period and requires significant financial outlays.

[2] See Figure 3.

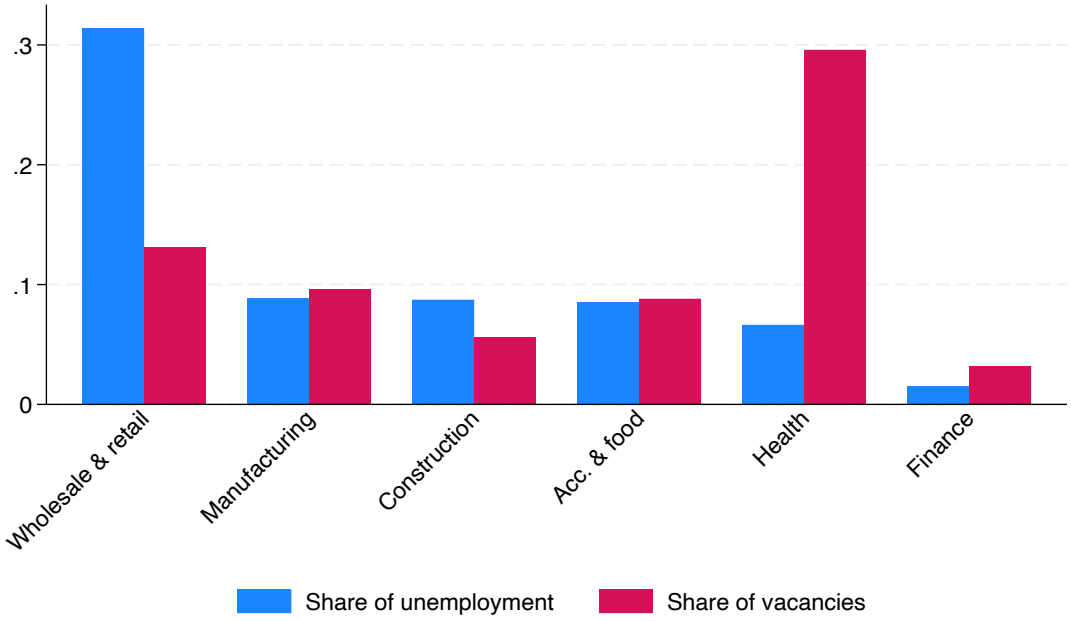

Figure 1: Share of Unemployment and Vacancies for Major Industries

Notes: Shares of unemployment and vacancies of selected major industries, Québec, 2024. Unemployment rate is calculated as unemployment divided by the labour force. Vacancy rate is vacancies divided by employment.

industries accounting for most of the index (Table 3). Wholesale and retail trade is particularly quantitatively important since the number of job seekers far exceeds job openings in this sector. This sector is also relatively bad at matching job seekers to openings. Consequently, around 40% of mismatch can be attributed to this sector. Another noteworthy industry is health and social services, which has seen a rapid increase in job openings over the last decade without a concurrent increase in job seekers. The result is that the contribution of health and social services to mismatch has increased rapidly between 2016 and 2025.

This report is based on the methodology of Sahin et al. (2014). This methodology is useful in that it summarizes in a single index the consequences of mismatch between job seekers and job openings. It accounts not only for gaps between job seekers and unemployment in an industry, as illustrated in Figure 1, but also for differences in the matching technology, which summarizes the frictions in the labour market. It thus provides a useful diagnostic tool for understanding to what extent changes in unemployment over time arise from job seekers not searching for jobs in the sectors best placed to hire them.

The methodology does make a number of strong assumptions. Most importantly maybe, this approach contrasts the observed distribution of job seekers with an idealized economy in which job seekers are distributed across sectors so as to maximize the job finding rate and thus minimize unemployment. In reality, lack of qualifications and other barriers will make this idealized world impossible to attain. Any economy will thus exhibit some mismatch as defined here.

A second major problem arises because constructing the index requires determining the sector in which job seekers are searching. The data at our disposal only allows to do so based on past industry. A job seeker will be

assigned to search in a sector if the last job held was in this industry. The mismatch index, as calculated here, will therefore not capture search from individuals moving into this sector, be it because of moves across industries or across provinces.

We believe that these methodological shortcomings imply that variation in the mismatch index over time is more informative than the level of mismatch. Assuming that barriers to mobility are constant, variation in the index over time suggests that changes in unemployment arise due to how the alignment between job seekers and job openings varies over time. The increase in the index in Quebec that can be linked to the evolving disparity between job seekers and vacancies in health and social services illustrates how this methodology can be used to pinpoint emerging problems in the labour market despite its methodological shortcomings. In this particular case, it suggests directing further research into exploring the determinants of job seeking in health and social services.

The report is structured as follows. We begin by describing in Section 1 the basic methodology following Sahin et al. (2014) and the mismatch index that arises from it. Section 2 introduces the data used to implement this methodology. Section 3 describes the estimation required to compute the index, and Section 4 presents results.

1 Methodology

1.1 Sahin et al. (2014)

We follow Sahin et al. (2014) to calculate the mismatch index that indicates how much job finding rates fall short of the ideal level attained if job seekers were optimally distributed across sectors.[3] In the following, we show how the mismatch index is derived. Readers less interested in the technical details may wish to skip forward to the next section.[4]

As is common in the literature, we assume that in period t and market segment i (here defined as the interaction between industry and province), the number of new hires H_{it} is a function of the numbers of job seekers u_{it} and vacancies v_{it}:

$$H_{it} = \Phi_t \phi_{it} v_{it}^{\alpha} u_{it}^{1-\alpha}, \quad \alpha \in (0,1), \tag{1}$$

where Φ_t and ϕ_{it} are aggregate- and sector-specific "productivity" or "matching efficiency" of the matching function in period t. This "matching function", which has a long tradition in the literature (see Petrongolo and Pissarides (2001) for a review of empirical work on the matching function), captures the idea that hires, or "matches", arise from the interaction of job seekers and firms posting job vacancies. Hiring increases both in the number of job seekers or vacancies, but at a decreasing rate.

[3] Sahin et al. (2014) developed this approach in the context of the Great Recession in the US, when the policy discourse was primarily concerned with geographic mismatch arising because job seekers were locked into locations with low job finding rates because their mortgages were underwater. Sahin et al. (2014) developed a diagnostic tool to determine how much of the increase and persistence in unemployment during the Great Recession might have been due to increased misalignment between job seekers and job openings. As discussed in the introduction, we believe that this tool can help diagnose instances when misalignment changes over time, but should not literally be taken as an estimate of the overall contribution of mismatch to the level of unemployment.

[4] See Appendix A for additional details on the derivation.

The parameter α, which is central to our analysis and which we estimate below, governs the relative contribution of job seekers and vacancies to the creation of new matches.

The parameter Φ_t varies over time as the ease of forming matches might vary in ways that apply to all sectors. The parameter ϕ_{it} allows for variation over time in how easy it is to form matches in specific industries. For example, matches may be more difficult to form in industries where specialized skills are important. In the following derivations, we drop the term Φ_t and any time subscripts to keep the notation simple.

With these assumptions, the job finding rate, or the probability that a job seeker finds a job in industry-province i is

$$h_i \equiv \frac{H_i}{u_i} = \phi_i \left(\frac{v_i}{u_i}\right)^{\alpha}. \tag{2}$$

The job finding rate increases in the matching efficiency ϕ_i and the number of vacancies in that sector, but declines with the number of other, competing job seekers in the same sector. As is common in the literature, we call the ratio of vacancies to searchers in a sector, v_i/u_i, "labour market tightness", and denote it by θ_i. With this notation, the job finding rate in sector i becomes

$$h_i = \phi_i \theta_i^{\alpha}. \tag{3}$$

When $0 < \alpha < 1$, then the rate at which workers find jobs is concave in θ_i. Therefore, in order to increase the overall hiring rate and thus reduce unemployment, it is optimal to allocate the unemployed across sectors in a way that equalizes the job finding rate across sectors. This implies the following condition for tightness across any two sectors i and j,

$$h_i^* = h_j^* \quad \Leftrightarrow \quad \phi_i \theta_i^{*\alpha} = \phi_j \theta_j^{*\alpha}. \tag{4}$$

Here and in the following, optimal allocations are denoted with an asterisk. At the optimum, job finding rates are equated across sectors. If they were not – for example, if $h_i < h_j$ – the number of hires could be increased if more workers searched in sector j rather than i, since in sector j the probability of success is higher.

Given a distribution of vacancies, this condition implies an optimal allocation of job seekers across sectors:

$$u_i^* = \frac{v_i}{v_j} \left(\frac{\phi_i}{\phi_j}\right)^{\frac{1}{\alpha}} u_j^*. \tag{5}$$

This equation shows that to maximize overall hires, there should be more job seekers in sectors where there are more vacancies (high v_i/v_j), and in sectors where matching is more efficient (high ϕ_i/ϕ_j). Aggregating across sectors, this equation implies that the optimal number of searchers for any sector j is given by

$$u_j^* = u \frac{v_j \phi_j^{\frac{1}{\alpha}}}{\sum_i v_i {\phi_i}^{\frac{1}{\alpha}}}, \tag{6}$$

where u is the total number of job seekers.

With this optimal allocation of searchers across sectors, optimal total hires are given by

$$H^* = \sum_i H_i^* = \sum_i u_i^* h_i^* = u^{1-\alpha} \left[\sum_i \phi_i^{\frac{1}{\alpha}} v_i \right]^{\alpha}. \tag{7}$$

Defining

$$\bar{\phi} \equiv \left[\sum_i \phi_i^{\frac{1}{\alpha}} \frac{v_i}{v} \right]^{\alpha}, \tag{8}$$

this implies

$$H^* = \bar{\phi} v^{\alpha} u^{1-\alpha}, \tag{9}$$

where v denotes total vacancies.

Comparing sectors, as seen above, the optimal job finding rate is equal across sectors, and also equals the aggregate job finding rate. The optimal share of hires in a sector then is as follows:

$$\frac{H_i^*}{H^*} = \frac{h_i^* u_i^*}{h^* u} = \frac{u_i^*}{u} = \frac{v_i \phi_i^{\frac{1}{\alpha}}}{v \bar{\phi}^{\frac{1}{\alpha}}}. \tag{10}$$

The optimal number of hires is greater in sectors with more vacancies or where matching is easier.

1.2 The mismatch index

In practice, the allocation of job seekers across sectors will deviate from the optimal allocation, and actual aggregate hires H will fall short of the potential maximum H^*, as some job seekers search in sectors with relatively low job finding probabilities. The mismatch index quantifies this discrepancy.

Consider the index M:

$$M = \frac{H^* - H}{H^*} = 1 - \frac{H}{H^*}. \tag{11}$$

It measures the fraction by which the actual hires fall short of the maximum attainable hires because searchers are not optimally allocated across sectors.

Using the matching function and equation (9), this index is given by

$$M = 1 - \frac{H}{H^*} = 1 - \frac{\sum_i \phi_i v_i^{\alpha} u_i^{1-\alpha}}{\bar{\phi} v^{\alpha} u^{1-\alpha}}. \tag{12}$$

The mismatch index M ranges from zero to one.[5] It equals zero when observed hires H are equal to counterfactual optimal hires H^*. It equals one if actual hires H are zero. Higher values of the index indicate a greater degree of mismatch, and thus a greater share of hires lost.

[5] See Appendix A.5 in Sahin et al. (2014).

Since the index aggregates across sectors, one can also separate it into its sectoral contributions. Therefore, we also present results showing how the discrepancy between optimal and actual unemployment in individual industries contributes to aggregate mismatch M.

1.3 Measurement

Computing the mismatch index given in equation (12) requires data on vacancies and job seekers for sectors i and time t. We describe these data in the next section.

In addition, computing the index requires estimates of the parameters α and ϕ_i.[6] We describe the estimation in more detail in Section 3.

2 Data

To implement this approach, we first need to estimate the parameters $\{\alpha, \phi_i\}$. To estimate these parameters, we need not just data on vacancies and unemployment across sectors, but also data on hires by sector. Once these parameters are obtained, it suffices to have access to data on vacancies and unemployment without requiring hiring data across sectors to construct the mismatch index.

For both the estimation and the construction of the mismatch index, we rely on data on job seekers and vacancies from the Labour Force Survey (LFS) and the Job Vacancy and Wage Survey (JVWS). The required data for the index are publicly available from April 2015 up to the most recent available period, which at the time of the writing of this report is June 2025. We refer to this data as the "Index data." The *Index data* is dynamic in the sense that it is updated monthly as Statistics Canada makes new data publicly available as part of its ongoing data collection efforts.

To estimate $\{\alpha, \phi_i\}$ we also need data on hires, which are unfortunately not publicly available. For these, we require access to the confidential Labour Force Survey longitudinal micro data available at the Statistics Canada Research Data Centres subject to strict confidentiality provisions. Thus, for estimation, we use data on job seekers and hires from the confidential LFS and on vacancies from the JVWS for February 2016 to April 2024. We refer to this data as the "Estimation data."

Since the hiring data is not publicly available, the *Estimation data* cannot be continuously updated without going through a complex process of vetting the resulting output. Thus, the *Estimation data* is by necessity fixed. The *Index data* required to calculate the mismatch index given parameter values is however publicly available using data collected close to the present time. We can thus update the mismatch index using public data with little delay.

Our analysis requires data at the province and industry level. We obtain these from the LFS and the JVWS. The JVWS provides monthly measures of vacancies by province and industry. The public-use LFS provides monthly measures of unemployment by province and industry.[7] Note that the industry of the unemployed is assigned based on the prior industry a worker was employed in. We use this series as our measure of job seekers.[8]

[6] The parameter Φ_t affects H and H^* similarly and thus does not enter the index.

[7] These data can be found in Statistics Canada Table 14-10-0442-01 at https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1410044201 and Table 14-10-0022-01 at https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1410002201.

[8] We are interested in the extent to which unemployed job seekers search in the optimal sector. Therefore, we only include unem-

Hires by industry are not part of the public-use data. We thus measure hires using the confidential panel LFS, which tracks individuals over six months. To estimate the matching function, we first estimate the number of hires in an industry by counting the transitions from unemplyment into employment in this industry in a given month. We then obtain a job finding rate by dividing this number of hires by the number of job seekers in an industry obtained from the Statistics Canada table. Finally, we estimate the matching function by projecting the log job finding rate on the log labour tightness constructed using the estimate of job seekers and vacancies in an industry.

The data allow distinguishing the following 14 industries:[9]

- Accommodation and food services
- Business, building and other support services
- Construction
- Educational services
- Finance and insurance
- Health care and social assistance
- Information, culture and recreation
- Manufacturing
- Other services (except public administration)
- Professional, scientific and technical services
- Public administration
- Real estate and leasing
- Transportation and warehousing
- Wholesale and retail trade

Statistics Canada data are available for the Canadian provinces. Our analysis focuses on Québec. We also compute the mismatch index for Ontario for comparison. To respect Statistics Canada's confidentiality requirements, we aggregate the provinces of Manitoba and Saskatchewan into the "Prairies", and New Brunswick, New Foundland and Labrador, Nova Scotia and Prince Edward Island into the "Maritimes".

To maximize coverage of our analysis, we use monthly data going back to the inception of the JVWS, in April 2015, and up to June 2025 for the *Index data*. The *Estimation data* covers February 2016 to April 2024. Since the JVWS was not collected in the second and third quarters of 2020, the height of the Covid-19 recession, our analysis cannot cover that period.[10]

Tables 1 and 2 give an overview of the data that enters our analysis. Over the period of analysis, the unemployment rate in Québec averaged 5.5%, with a standard deviation of 1.2 percentage points. The vacancy rate, defined as the number of vacancies relative to employment, on average was just shy of 3%, with a standard deviation of 1.2 percentage points. The job finding rate, i.e. the fraction of the unemployed who find a job, averaged 24 percent per month. It exhibited significant variation over time, with a standard deviation of ten percentage points. On average, new hires per month on average made up just short of one percent of employment. All of these statistics were fairly similar in Québec, Ontario, and Canada as a whole.[11]

ployed job seekers in our measure. Similarly, we only include those leaving unemployment in our measure of hires. This implies that the matching function we estimate does not capture job to job transitions. It also does not capture job transitions of individuals not in the labour force or moves across provinces.

[9] We ignore utilities due to lack of available data. We ignore the agriculture, forestry, fishing and hunting industries, since their definition is not consistent between the LFS and the JVWS.

[10] We also omit March 2020, when unemployment spiked due to Covid-19 lockdowns.

[11] Unemployment rates were a bit higher, and vacancies a bit lower, in Alberta and the Maritimes. In BC, in contrast, unemployment was lower and vacancies more numerous.

Table 1: Summary Statistics by Region February 2016 — April 2024 (excl. March 2020 — September 2020)

Variable	QC	ON	AB	BC	Maritimes	Prairies	Canada
Unemployment Rate							
Mean	0.055	0.062	0.072	0.054	0.090	0.056	0.062
SD	0.012	0.012	0.014	0.009	0.015	0.010	0.011
Vacancy Rate							
Mean	0.029	0.027	0.025	0.034	0.023	0.024	0.028
SD	0.012	0.007	0.007	0.008	0.007	0.008	0.008
Job Finding Rate							
Mean	0.240	0.214	0.215	0.232	0.206	0.238	0.220
SD	0.100	0.091	0.080	0.097	0.094	0.153	0.084
Hires Rate							
Mean	0.009	0.008	0.010	0.008	0.012	0.008	0.009
SD	0.003	0.003	0.003	0.003	0.005	0.004	0.003
Tightness							
Mean	0.863	0.759	0.597	1.068	0.407	0.725	0.751
SD	0.505	0.324	0.298	0.387	0.201	0.396	0.341

Notes: Unemployment rate is calculated as unemployment divided by the labour force. Vacancy rate is vacancies divided by employment. Job finding rate is calculated as hires divided by unemployment. Hires rate is calculated as hires divided by employment. Tightness is calculated as vacancies divided by unemployment. Data excludes the Covid period (March 2020 - August 2020). Maritimes combines Nova Scotia, New Brunswick, Prince Edward Island, and Newfoundland and Labrador. Prairies combines Saskatchewan and Manitoba. The unemployment rate includes all unemployed workers, including those without a known prior sector. These workers are excluded from all other statistics, which are based only on the 14 sectors analysed.

Industries, in contrast, differ significantly. Table 2 shows summary statistics for the five largest industries by employment. Here, construction stands out for its high unemployment rate. Unemployment in wholesale and retail trade is also elevated even if less dramatically than in construction. Education and professional services have unemployment rates not far from the average. Health and social services in contrast has a very low unemployment rate. Vacancy rates also vary across industries. Among the large industries, they are highest in health care and construction. They are significantly lower, and also lower than the overall average, in wholesale and retail, education, and professional services.

The combination of high unemployment and low vacancy rates implies that tightness in wholesale and retail is very low. By contrast, health and social services have both low unemployment and high vacancy rates, implying that this part of the labour market is very tight.

Among the large industries, the job finding rates are highest in education and in health and much lower in the other three major industrial sectors listed in Table 2. Given the low vacancy rate in education, this points to a high matching efficiency in the sector. Thus, this simple comparison already indicates that vacancy rates and matching efficiency vary across industries. In the next section, we explicitly estimate a matching function which we use to recover the matching efficiency for each sector.

Table 2: Summary Statistics for Top-5 Industries, Quebec, February 2016 — April 2024 (excl. March 2020 — September 2020)

Variable	Wholesale & Retail Trade	Health Care & Social Assistance	Construction	Educational Services	Professional Scientific & Technical Services
Unemployment Rate					
Mean	0.040	0.016	0.073	0.030	0.026
SD	0.014	0.005	0.044	0.036	0.008
Vacancy Rate					
Mean	0.017	0.041	0.029	0.010	0.031
SD	0.007	0.023	0.014	0.004	0.010
Job Finding Rate					
Mean	0.126	0.378	0.350	0.618	0.265
SD	0.068	0.521	0.249	0.970	0.183
Hires Rate					
Mean	0.005	0.006	0.024	0.012	0.007
SD	0.003	0.009	0.017	0.017	0.005
Tightness					
Mean	0.483	2.828	0.574	0.605	1.422
SD	0.323	1.753	0.505	0.494	1.137

Notes: Unemployment rate is calculated as unemployment divided by labour force. Vacancy rate is vacancies divided by employment. Job finding rate is calculated as hires divided by unemployment. Hires rate is calculated as hires divided by employment. Tightness is calculated as vacancies divided by unemployment. Data excludes the COVID period (March 2020 - August 2020). Industries are grouped according to NAICS codes with some categories combined for analysis consistency.

3 Matching Function Estimation

Calculation of the mismatch index M requires estimates of the elasticity of the matching function with respect to vacancies α and of the industry-specific matching efficiency ϕ_i. This estimation is based on equation (3) in logs, and including time variation:

$$\log h_{ipt} = \text{constant} + \log \Phi_t + \log \phi_{ip} + \alpha \log \theta_{ipt} + \varepsilon_{ipt}, \tag{13}$$

where i denotes industry, p region, and t time. We model $\log \phi_{ip}$ as a full set of industry and region fixed effects. We weight observations by the region $\times$ industry's share of total unemployment.

We estimate an elasticity of hires with respect to tightness, α, of 0.501, at the centre of the range of typical estimates in the literature (see e.g. Petrongolo and Pissarides, 2001). This implies that vacancies and job seekers have a quantitatively similar impact on hires.

Table B1 reports estimates of industry and region fixed effects. For ease of interpretation, we report these relative to the national mean.[12] The results in Table B1 reveal that the matching efficiency ϕ differs significantly across industries and provinces. Comparing industries, matching is relatively less efficient in wholesale and retail as well as accommodation and food services. Construction, educational services, and information, culture

[12] All sets of fixed effects are jointly strongly statistically significant. The table does not report time fixed effects because they do not matter for the mismatch index, since they affect actual and optimal hires equally.

and recreation are estimated to be particularly efficient in matching job seekers to job openings.[13] Comparing provinces, matching efficiency in Quebec and Ontario are quite similar to the nationwide average. By contrast, British Columbia is estimated to be less efficient in matching job seekers to openings, while the maritime provinces are more efficient than the Canadian average.

4 Mismatch in Quebec

With estimates of α and ϕ_i in hand, we compute the mismatch index M. Figure 2 shows the aggregate time series for Québec that enter the index.[14]

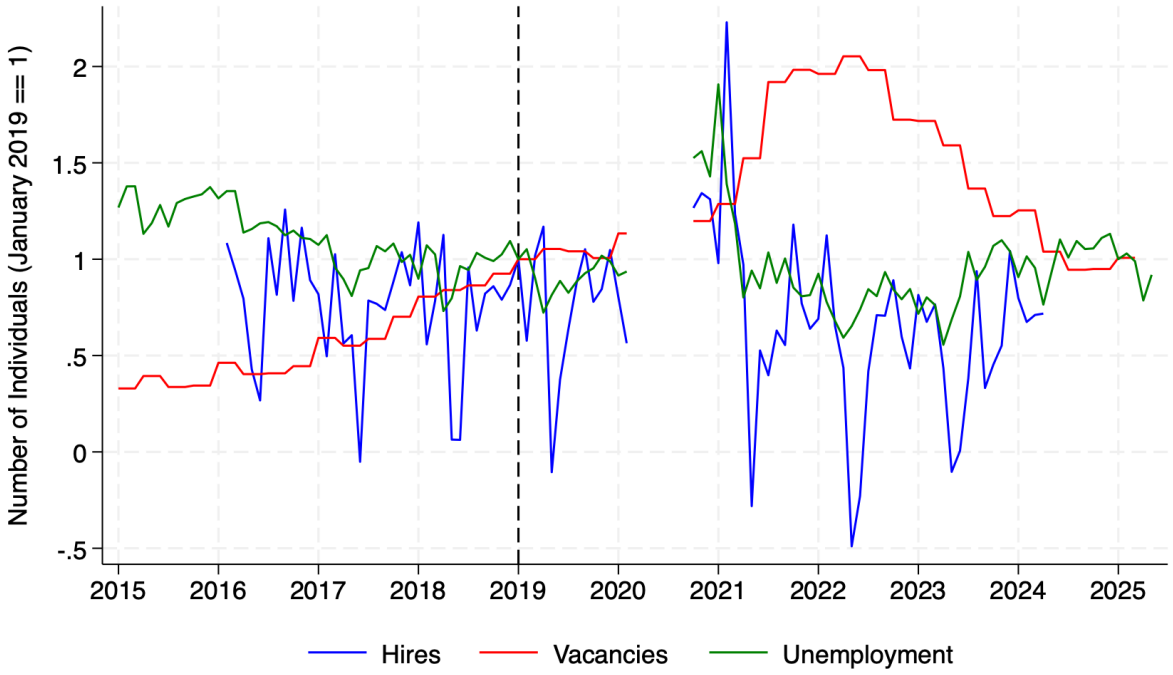

Figure 2: Hires, Unemployment and Vacancies in Quebec

Figure 3 shows the mismatch index for Quebec. The fainter, blue line shows monthly values for the index. Because these are quite volatile, we also plot a 6-month moving average using a bolder, red line. The mismatch index takes on values ranging broadly from 0.06 to 0.11, with a mean of 0.086, indicating that 6 to 11% of potential hires are lost to mismatch of job seekers across industries. The index clearly increases over time. Up to 2017, it fluctuates between 6 and 7%. It then increases to about 8.5%. After the Covid recession, the index is more volatile, fluctuating around a higher level of around 10%.[15]

[13] Information, culture and recreation is a broad category that aggregates smaller industries that are quite distinct from each other. Caution is warranted in interpreting results specific to this industry.

[14] The index relies on data on vacancies and unemployment, which are publicly available for the entire index data period. For information, the figure also shows actual hires, which are computed from confidential data and are only available for the estimation data period.

[15] Annual averages are shown in Table C1.

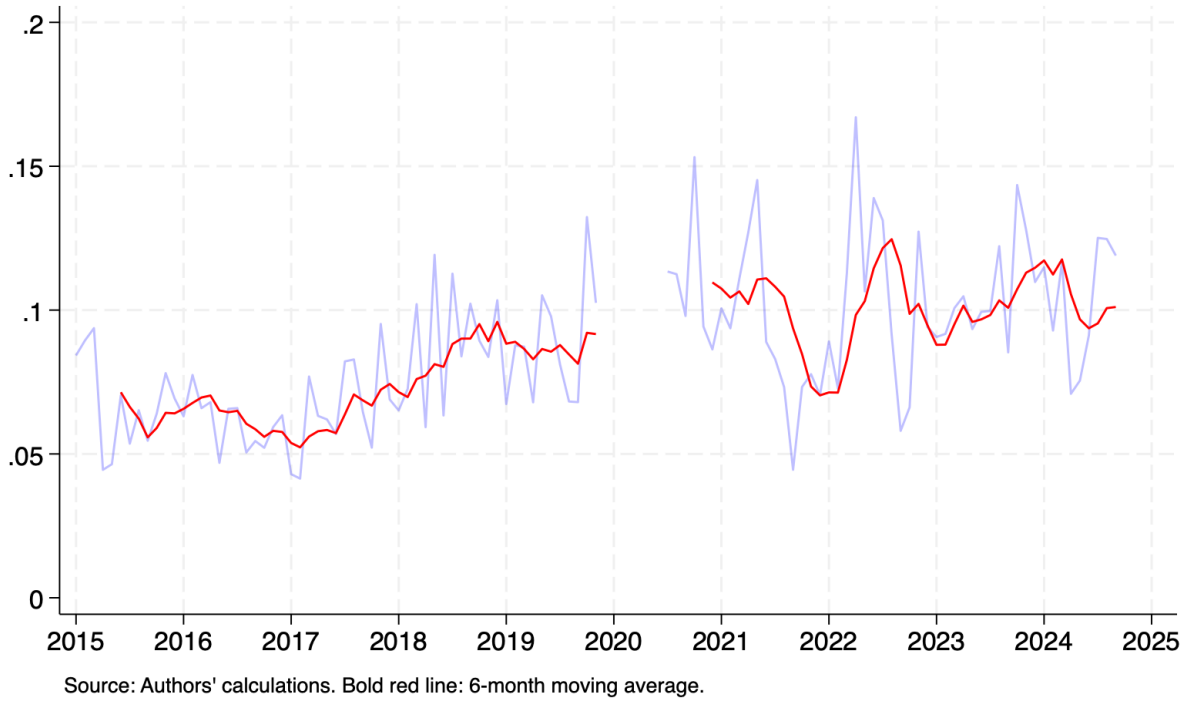

Figure 3: Mismatch Index for Quebec

4.1 The contribution of different industries

Table 3 shows the contribution of different industries to the index in 2024. The first column of the table shows, for each industry, by which fraction the mismatch index would decline if the fraction of searchers in that industry was at its optimal level u_i^*.[16] This reveals that the largest contributor by far is wholesale and retail trade, which accounts for close to half of total mismatch. The second largest contribution comes from health care and social assistance, which accounts for a quarter of aggregate mismatch. Education accounts for 18 percent, and construction for 10. The contributions of other industries are much smaller.

There are two reasons why an industry might contribute substantially to the mismatch index. First, holding the matching efficiency constant, there might be an imbalance between the number of job seekers and job vacancies. This explains for example why wholesale and retail trade contributes so strongly to the index. This industry has by far the largest number of job seekers (almost a third), but accounts for less than a seventh of vacancies. In contrast, the three next-largest industries in terms of job seekers – manufacturing, professional services, and accommodation and food services – have fairly balanced shares of vacancies and unemployment, implying much smaller contributions to mismatch. The contribution of the health care and social services sector to mismatch is high for the same reason: this industry accounts for by far the largest share of vacancies – around 30 percent – but has a much smaller share of job seekers (only about 7 percent).

[16] We compute this as follows. In the data, all industries have $u_i \neq u_i^*$. We compute the counterfactual value of the index, $\widehat{M}_i$, that would be obtained if unemployment in industry i was optimal ($u_i = u_i^*$), and unemployment in the other industries is adjusted in proportion to their share of total unemployment. Table 3 shows $(M - \widehat{M}_i)/M$, i.e. how much lower mismatch would be if unemployment in industry i was optimal. Note that due to non-linearities, the contributions need not sum to 100 percent..

Second, mismatch is high if many workers search in an industry with low matching efficiency. Here we see a further reason for the large contribution of wholesale and retail trade to the mismatch index: match efficiency in this industry is particularly low. For the same reason, mismatch is high in educational services and construction: both industries have very high levels of matching efficiency. These more than make up for their unimpressive share of vacancies, implying that the optimal share of searchers in these industries is much higher than the actual share.[17]

Hence, to understand the extent of mismatch, it is not sufficient to simply compare the distributions of vacancies and job seekers across sectors. It is crucial to also take the variation in matching efficiency across sectors into account.

Table 3: Industry contributions to aggregate mismatch (share of aggregate mismatch)

	Share of mismatch	Share of unemployment	Share of vacancies	Relative matching efficiency	Share of optimal unemployment
Industry					
Accommodation and food services [72]	0.016	0.085	0.088	0.700	0.043
Business and other support services [55, 56]	0.009	0.052	0.046	0.811	0.031
Construction [23]	0.102	0.087	0.056	1.628	0.147
Educational services [61]	0.180	0.053	0.036	1.912	0.131
Finance and insurance [52]	0.001	0.015	0.032	0.639	0.013
Health care and social assistance [62]	0.249	0.066	0.296	0.814	0.196
Information, culture and recreation [51, 71]	0.008	0.053	0.025	1.475	0.053
Manufacturing [31-33]	0.008	0.089	0.096	0.967	0.090
Other services (except public admin) [81]	0.058	0.033	0.043	1.275	0.070
Prof., scientific and tech. services [54]	0.002	0.086	0.074	0.963	0.068
Public administration [91]	0.013	0.018	0.018	1.209	0.027
Real estate and rental and leasing [53]	0.008	0.016	0.012	1.133	0.016
Transportation and warehousing [48-49]	0.014	0.040	0.046	1.040	0.050
Wholesale and retail trade [41, 44-45]	0.449	0.314	0.131	0.695	0.063

Note: The table shows the change in the mismatch index when the number of job seekers is adjusted to the optimal level in that industry. Adjustments are made by redistributing or drawing from other industries according to the distribution of job seekers across industries. Contributions to the index do not sum to 100%. The table is based on 2024 values.

4.2 Why has mismatch in Québec increased over time?

Table 4 shows the contribution of each industry to the observed increase in the mismatch index from 6-7 percent to around 10 percent.[18] The two largest drivers of the increase in the index are health care and wholesale and retail, each pushing the index up by more than two percentage points. Educational services have contributed an increase of almost 1.5 percentage points, and construction 0.7 percentage points. The contribution of most

[17] Note that while information, culture and recreation also has a very high matching efficiency, it has very low levels of vacancies. As a result, the actual and optimal shares of job seekers come very close, and its contribution to mismatch is minimal.

[18] To obtain these numbers, we compute the contribution of each industry to the level of the mismatch index in both 2016 and 2024 as outlined above. The table shows the change in these contributions. In the notation of footnote 16, it shows $(M_{2024} - \widehat{M}_{i,2024}) - (M_{2016} - \widehat{M}_{i,2016})$. A positive value thus implies a contribution to the increase in the index.

other industries to mismatch declined, with professional services as well as information, culture, and recreation contributing about 0.5 percentage points to the decline.

Table 4: Changes in industry contributions to aggregate mismatch, 2016 to 2024

	Contribution to increase in mismatch	Change in share of unemployment	Change in share of vacancies
Industry			
Accommodation and food services [72]	-0.001	-0.000	-0.006
Business and other support services [55, 56]	0.001	-0.023	-0.038
Construction [23]	0.007	-0.042	0.027
Educational services [61]	0.014	0.004	0.018
Finance and insurance [52]	-0.002	-0.000	-0.041
Health care and social assistance [62]	0.024	0.021	0.190
Information, culture and recreation [51, 71]	-0.006	0.002	-0.019
Manufacturing [31-33]	-0.001	-0.022	-0.039
Other services (except public admin) [81]	-0.001	0.002	-0.003
Prof., scientific and tech. services [54]	-0.005	0.038	-0.017
Public administration [91]	-0.002	-0.007	-0.013
Real estate and rental and leasing [53]	-0.000	0.002	-0.003
Transportation and warehousing [48-49]	-0.000	-0.001	-0.006
Wholesale and retail trade [41, 44-45]	0.022	0.035	-0.051

Note: The first data-column shows the percentage point change in the index between 2016 and 2024 accounted for by a given industry, $(M_{2024} - \widehat{M}_{i,2024}) - (M_{2016} - \widehat{M}_{i,2016})$ in the notation of footnote 16. The second and third columns of data show the percentage point change in the share of unemployment and vacancies of a given industry for the same time-period.

Figure 4 shows the time series of the contribution to mismatch for the industries with the largest increases plus professional services. Figures 5 and 6 show the changes in the unemployment and vacancy shares of these industries.

These figures show that while the contribution of wholesale and retail to mismatch is generally volatile, there is clearly an increasing trend. This reflects the stable share of job seekers in this industry despite a decline in the share of vacancies by five percentage points, or a quarter. As a result, the imbalance between the high fraction of job seekers and the lower fraction of vacancies in this industry worsened over time.

Very much the opposite pattern can be seen in health care and social assistance. The share of vacancies in the sector increased continuously up to 2019, and exploded after the Covid Recession. This holds not only directly in the aftermath of this recession, but even more so in 2023 and 2024. Overall, the share of vacancies accounted for by this industry almost tripled, from around ten to about thirty percent. At the same time, the share of job seekers only increased slightly. A similar pattern is behind the increasing contribution of the education sector.[19]

The contribution of construction to mismatch increased because its share of job seekers declined despite a growing share of vacancies. Note that mismatch in this sector is highly cyclical.

The increase in mismatch in Québec since 2016 thus mostly reflects the fact that vacancies increased enormously in health care and declined in wholesale and retail, while the distribution of job seekers across industries

[19] The high matching efficiency in education compared to health care explains why the contribution of education to mismatch has grown so much, although its share of vacancies has increased much less.

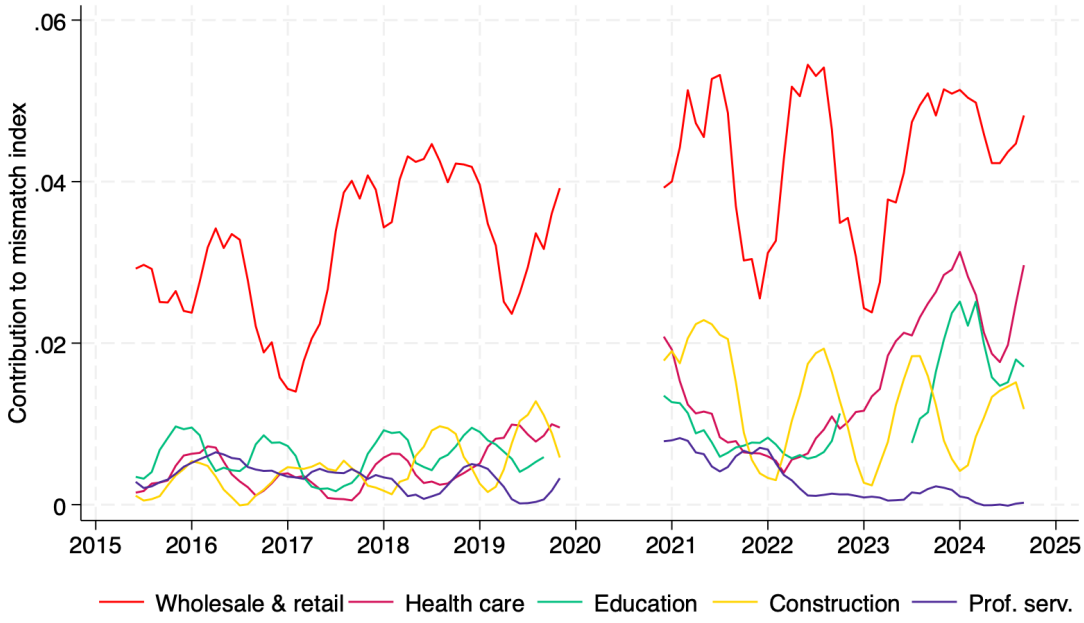

Figure 4: Industry contributions to aggregate mismatch over time, industries with largest changes (6-month moving average)

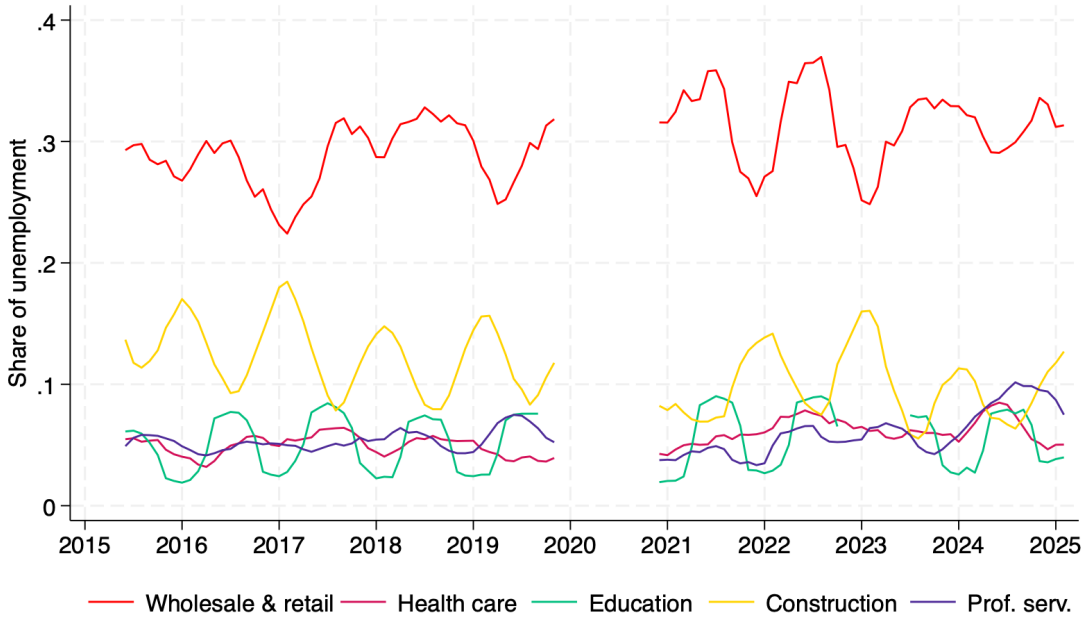

Figure 5: Industry shares of unemployment over time, industries with largest change in contribution to mismatch (6-month moving average)

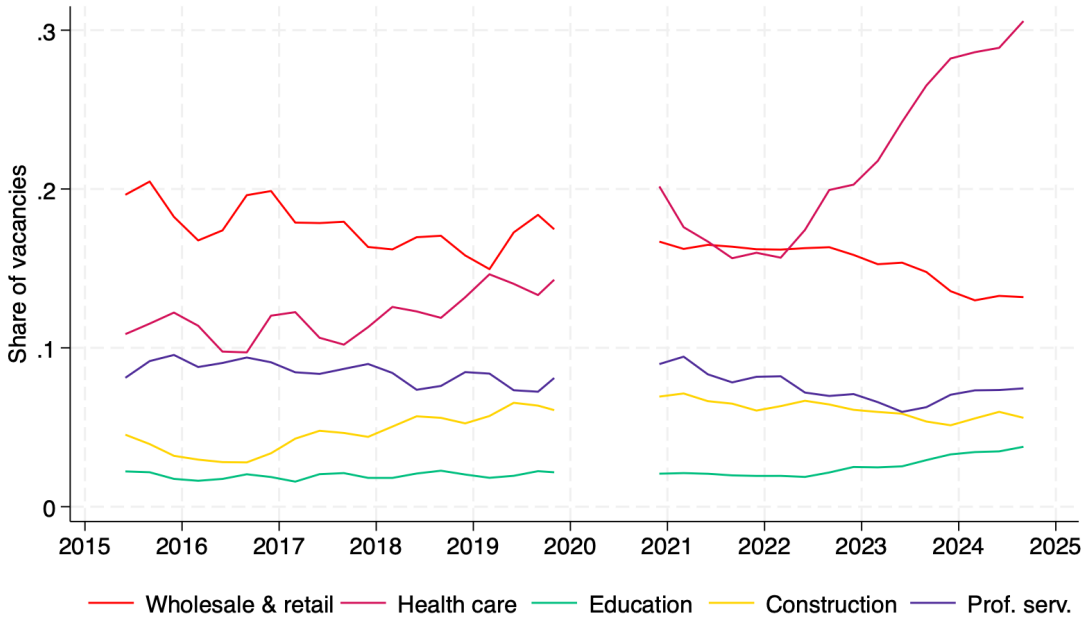

Figure 6: Industry shares of vacancies over time, industries with largest change in contribution to mismatch (6-month moving average)

hardly changed. Statistics Canada data indicate that health care has seen the largest increase in its share of employment (by 1.2 percentage points, from 12.3 to 13.5%), except for professional services. Wholesale and retail trade has by far the largest decline: its employment share fell by 2 percentage points, from 17.6 to 15.6%.[20]

4.3 A comparison to Ontario

Finally, Figure 7 compares the mismatch index in Québec (blue) to that in Ontario (red).[21] Mismatch in the two provinces was at similar levels before the Covid recession, possibly increasing slightly more in Québec. After the recession, the index was consistently higher in Québec, where it fluctuated around ten percent, whereas it fluctuated around eight percent in Ontario.

Tables 5 and 6 show industry contributions to the index in the two provinces in 2016 and 2024, respectively. This reveals that by and large, the same sectors are the main contributors to mismatch in both provinces. However, the wholesale and retail trade and the health care and social assistance sectors in Québec contribute about a percentage point each more to mismatch, thus accounting for almost the entire difference in mismatch between the two provinces in 2024.

There was no such gap in 2016, and as a result, mismatch in the two provinces were similar in that year. As shown in Tables C2 to C5, the increase in vacancies in the health care sector in Québec exceeded that in Ontario. Whereas vacancies did increase strongly in Ontario – their share of aggregate vacancies more than doubled – it almost tripled in Québec.

[20] Data source: Statistics Canada Table 14-10-0202-01.

[21] All series are smoothed using a 6-month moving average, as in Figure 3.

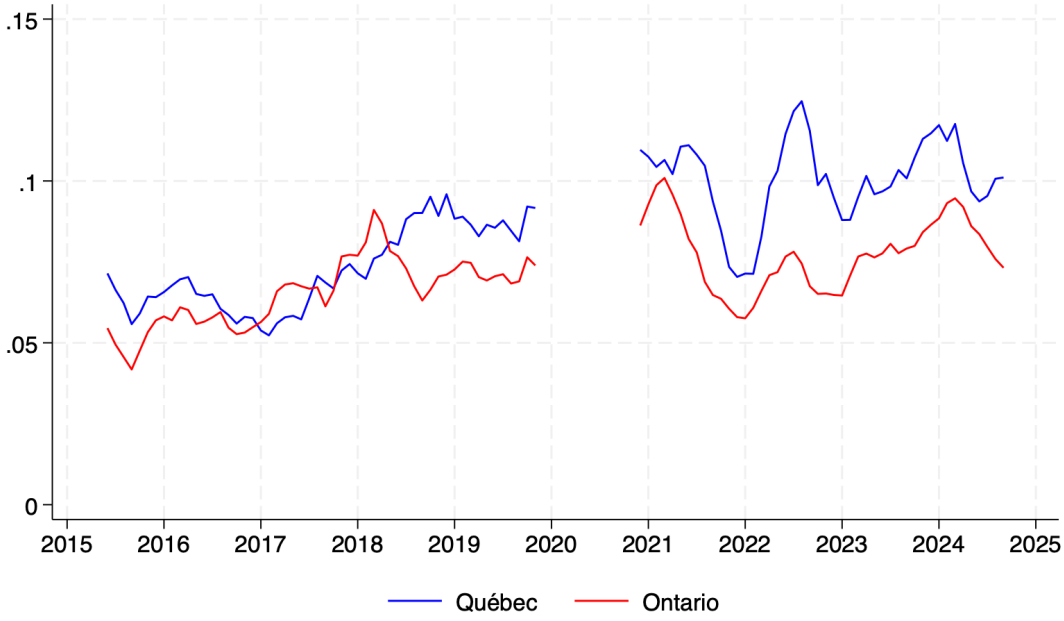

Figure 7: Mismatch Index for Québec and Ontario (6-month moving average)

Table 5: Industry contributions to aggregate mismatch, Québec and Ontario, 2024

	Province	
	ON	QC
Industry		
Accommodation and food services [72]	0.001	0.002
Business and other support services [55, 56]	0.000	0.001
Construction [23]	0.008	0.010
Educational services [61]	0.021	0.021
Finance and insurance [52]	0.001	0.000
Health care and social assistance [62]	0.019	0.028
Information, culture and recreation [51, 71]	0.000	0.001
Manufacturing [31-33]	0.001	0.001
Other services (except public admin) [81]	0.004	0.006
Prof., scientific and tech. services [54]	-0.000	0.000
Public administration [91]	0.003	0.001
Real estate and rental and leasing [53]	0.001	0.001
Transportation and warehousing [48-49]	0.001	0.002
Wholesale and retail trade [41, 44-45]	0.036	0.049

The share of vacancies in wholesale and retail trade declined in a very similar way in both provinces – from about 18 to around 13 percent. In Ontario, the share of job seekers in the sector fell slightly. As shown above, it increased in Québec, strongly pushing up mismatch.

Summarizing, mismatch in Ontario increased less than in Québec because vacancies in health care increased less strongly, and because the fraction of job seekers in wholesale and retail remained stable.

Table 6: Industry contributions to aggregate mismatch, Québec and Ontario, 2016

	Province	
	ON	QC
Industry		
Accommodation and food services [72]	0.001	0.003
Business and other support services [55, 56]	0.000	0.000
Construction [23]	0.010	0.003
Educational services [61]	0.007	0.007
Finance and insurance [52]	0.001	0.003
Health care and social assistance [62]	0.001	0.004
Information, culture and recreation [51, 71]	0.009	0.006
Manufacturing [31-33]	0.000	0.002
Other services (except public admin) [81]	0.004	0.008
Prof., scientific and tech. services [54]	0.001	0.005
Public administration [91]	0.000	0.003
Real estate and rental and leasing [53]	0.001	0.001
Transportation and warehousing [48-49]	0.002	0.002
Wholesale and retail trade [41, 44-45]	0.029	0.027

5 Conclusion

In this report, we have computed an index that measures the contribution of mismatch to unemployment in Québec. Mismatch increased strongly from 2016 to 2024, mostly due to developments in two sectors. In health and social services, vacancies tripled, making it by far the dominant sector in terms of vacancies. At the same time, the fraction of job seekers in the sector only increased slightly. In contrast, an increase in the fraction of job seekers in wholesale and retail – already the largest sector in terms of job seekers – was accompanied by a decline in the share of vacancies in the sector.

These findings reflect the impact of structural changes currently occurring in the Québec economy on the labour market. The index thus is a useful tool for diagnosing sectoral imbalances in the labour market.

Our findings also raise a number of substantive and methodological questions for future work. First, why has the number of job seekers in health care increased so little? From what other sectors do workers move into the sector? Second, what is driving the decline in wholesale and retail? How does the rise of online shopping affect the structure of employment? To what industries can affected workers shift?

Answering these questions will also require better data on the industries in which job seekers search. Currently available data proxy this as the past industry of employment. This measure has shortcomings when there are significant changes in the structure of employment. Better measures would allow for more accurate measurement of the level of mismatch and the contribution of different industries.

References

Petrongolo, B. and Pissarides, C. A. (2001). Looking into the black box: A survey of the matching function. *Journal of Economic literature*, 39(2):390–431.

Sahin, A., Song, J., Topa, G., and Violante, G. L. (2014). Mismatch unemployment. *American Economic Review*, 104(11):3529–3564.

Appendix A: Detailed Derivation of Index

Assume that each sector/province, indexed by i, operates a separate labour market with a separate matching function. These matching functions are given by

$$H_{it} = \Phi_t \phi_{it} v_{it}^{\alpha} u_{it}^{1-\alpha}, \tag{14}$$

where H_i are hires in sector/province i, Φ_t and ϕ_{it} are aggregate and sector-specific "productivity" of the matching function, v_i are vacancies, and u_i are searchers (unemployed) in i. In the following, omit time subscripts.

Consider a planner who aims to maximize aggregate hires,

$$H = \sum_i H_i, \tag{15}$$

by allocating the unemployed across sectors i, taking ϕ_i and vacancies by i as given. Optimality requires equating the "marginal product" of the unemployed in terms of generating hires across sectors i and j, for any i, j:

$$\phi_i v_i^{\alpha} u^*{}_i^{-\alpha} = \phi_j v_j^{\alpha} u^*{}_j^{-\alpha}, \tag{16}$$

where u_i^* is optimal unemployment in i. This implies equating tightness $\theta_i \equiv v_i/u_i$ across sectors, adjusted for differences in matching productivity:

$$\theta_i^* \equiv \frac{v_i}{u_i^*} = \left(\frac{\phi_j}{\phi_i}\right)^{\frac{1}{\alpha}} \theta_j^*. \tag{17}$$

This is equivalent to equalizing the job finding rate across sectors i:

$$\phi_i \theta_i^{*\alpha} = \phi_j \theta_j^{*\alpha}. \tag{18}$$

Similarly,

$$u_i^* = \frac{v_i}{v_j} \left(\frac{\phi_i}{\phi_j}\right)^{\frac{1}{\alpha}} u_j^*. \tag{19}$$

Given vacancies, it is optimal to allocate more searchers to sectors with higher matching productivity.

In addition, the total number of searchers has to equal total unemployment:

$$u_t = \sum_i u_i^*. \tag{20}$$

For $j = 1$, this implies

$$u = \sum_i \frac{v_i}{v_1} \left(\frac{\phi_i}{\phi_1}\right)^{\frac{1}{\alpha}} u_1^* \tag{21}$$

so that

$$u_1^* = u / \sum_i \frac{v_i}{v_1} \left(\frac{\phi_i}{\phi_1} \right)^{\frac{1}{\alpha}} \tag{22}$$

or

$$\frac{u_1^*}{v_1 \phi_1^{\frac{1}{\alpha}}} = \frac{u}{\sum_i v_i \phi_i{}^{\frac{1}{\alpha}}} \tag{23}$$

With this allocation, optimal total hires are given by

$$H^* = \sum_i H_i^* = \sum_i \phi_i v_i^\alpha \left(\frac{v_i}{v_1} \right)^{1-\alpha} \left(\frac{\phi_i}{\phi_1} \right)^{\frac{1-\alpha}{\alpha}} u_1^{*1-\alpha} \tag{24}$$

$$= \sum_i \phi_i^{\frac{1}{\alpha}} v_i \left(\frac{u_1^*}{v_1 \phi_1^{\frac{1}{\alpha}}} \right)^{1-\alpha} \tag{25}$$

$$= \left(\frac{u}{\sum_i v_i \phi_i{}^{\frac{1}{\alpha}}} \right)^{1-\alpha} \sum_i \phi_i^{\frac{1}{\alpha}} v_i \tag{26}$$

$$= u^{1-\alpha} \left[\sum_i \phi_i^{\frac{1}{\alpha}} v_i \right]^\alpha. \tag{27}$$

Defining

$$\bar{\phi} \equiv \left[\sum_i \phi_i^{\frac{1}{\alpha}} \frac{v_i}{v} \right]^\alpha, \tag{28}$$

this implies

$$H^* = \bar{\phi} v^\alpha u^{1-\alpha} \tag{29}$$

or

$$\frac{H^*}{u} = \bar{\phi} \left(\frac{v}{u} \right)^\alpha. \tag{30}$$

Then the share of matches lost to misallocation of searchers across markets is

$$M = \frac{H^* - H}{H^*} = 1 - \frac{H}{H^*} \tag{31}$$

or equivalently

$$M = 1 - \frac{h}{h^*}, \tag{32}$$

letting hires per searcher be $h \equiv H/u$ and $h^* \equiv H^*/u$.

Using the matching function and equation (9), this implies

$$M = 1 - \frac{H}{H^*} = 1 - \frac{\sum_i \phi_i v_i^\alpha u_i^{1-\alpha}}{\bar{\phi} v^\alpha u^{1-\alpha}} = 1 - \frac{\sum_i \phi_i (v_i/u_i)^\alpha (u/u_i)^\alpha}{\bar{\phi}(v/u)^\alpha} \tag{33}$$

Appendix B: Matching Function Estimates

Table B1: Matching Function Estimation Weighted by Province x Industry

$\log \theta_{ipt}$	0.501
	(0.018)
Region Fixed Effects	
Alberta	-0.023
British Columbia	-0.202
Maritimes	0.249
Ontario	-0.027
Prairies	0.031
Quebec	0.061
Industry Fixed Effects	
Accommodation and food services [72]	-0.319
Business, building and other support services [55, 56]	-0.172
Construction [23]	0.524
Educational services [61]	0.685
Finance and insurance [52]	-0.411
Health care and social assistance [62]	-0.169
Information, culture and recreation [51, 71]	0.425
Manufacturing [31-33]	0.004
Other services (except public administration) [81]	0.280
Professional, scientific and technical services [54]	-0.001
Public administration [91]	0.227
Real estate and rental and leasing [53]	0.162
Transportation and warehousing [48-49]	0.076
Wholesale and retail trade [41, 44-45]	-0.327
R-squared	0.366
Time Fixed Effects	✓
Observations	6436

Standard error of the coefficient on θ in parentheses. All industry/region fixed effects are statistically significantly different from the reference group (Accomodation and food/Alberta) at the 1% level of significance, except for real estate and information, culture and recreation (5%). The fixed effects for Ontario and the Prairies are not statistically significantly different from the reference category (Alberta). Estimation uses as weights each region × industry's share of overall unemployment.

Appendix C: Additional Tables and Figures

Table C1: Mismatch index in Québec and Ontario, yearly averages

year	Province	
	ON	QC
2015	0.052	0.067
2016	0.058	0.064
2017	0.064	0.062
2018	0.077	0.083
2019	0.072	0.084
2021	0.083	0.100
2022	0.067	0.099
2023	0.078	0.098
2024	0.084	0.109

Table C2: Industry shares of unemployment, Québec and Ontario, 2024

	Province	
	ON	QC
Industry		
Accommodation and food services [72]	0.084	0.085
Business and other support services [55, 56]	0.055	0.052
Construction [23]	0.087	0.087
Educational services [61]	0.064	0.053
Finance and insurance [52]	0.035	0.015
Health care and social assistance [62]	0.047	0.066
Information, culture and recreation [51, 71]	0.075	0.053
Manufacturing [31-33]	0.092	0.089
Other services (except public admin) [81]	0.035	0.033
Prof., scientific and tech. services [54]	0.084	0.086
Public administration [91]	0.021	0.018
Real estate and rental and leasing [53]	0.012	0.016
Transportation and warehousing [48-49]	0.046	0.040
Wholesale and retail trade [41, 44-45]	0.263	0.314

Table C3: Industry shares of unemployment, Québec and Ontario, 2016

	Province	
	ON	QC
Industry		
Accommodation and food services [72]	0.096	0.086
Business and other support services [55, 56]	0.079	0.075
Construction [23]	0.099	0.130
Educational services [61]	0.053	0.049
Finance and insurance [52]	0.022	0.016
Health care and social assistance [62]	0.054	0.045
Information, culture and recreation [51, 71]	0.058	0.051
Manufacturing [31-33]	0.102	0.110
Other services (except public admin) [81]	0.031	0.032
Prof., scientific and tech. services [54]	0.061	0.048
Public administration [91]	0.026	0.025
Real estate and rental and leasing [53]	0.010	0.014
Transportation and warehousing [48-49]	0.031	0.041
Wholesale and retail trade [41, 44-45]	0.278	0.279

Table C4: Industry shares of vacancies, Québec and Ontario, 2024

	Province	
	ON	QC
Industry		
Accommodation and food services [72]	0.101	0.088
Business and other support services [55, 56]	0.071	0.046
Construction [23]	0.058	0.056
Educational services [61]	0.043	0.036
Finance and insurance [52]	0.049	0.032
Health care and social assistance [62]	0.228	0.296
Information, culture and recreation [51, 71]	0.035	0.025
Manufacturing [31-33]	0.068	0.096
Other services (except public admin) [81]	0.043	0.043
Prof., scientific and tech. services [54]	0.080	0.074
Public administration [91]	0.026	0.018
Real estate and rental and leasing [53]	0.013	0.012
Transportation and warehousing [48-49]	0.053	0.046
Wholesale and retail trade [41, 44-45]	0.132	0.131

Table C5: Industry shares of vacancies, Québec and Ontario, 2016

	Province	
	ON	QC
Industry		
Accommodation and food services [72]	0.122	0.094
Business and other support services [55, 56]	0.106	0.085
Construction [23]	0.064	0.029
Educational services [61]	0.026	0.018
Finance and insurance [52]	0.065	0.073
Health care and social assistance [62]	0.091	0.106
Information, culture and recreation [51, 71]	0.057	0.044
Manufacturing [31-33]	0.089	0.135
Other services (except public admin) [81]	0.038	0.046
Prof., scientific and tech. services [54]	0.083	0.091
Public administration [91]	0.015	0.031
Real estate and rental and leasing [53]	0.014	0.015
Transportation and warehousing [48-49]	0.045	0.052
Wholesale and retail trade [41, 44-45]	0.186	0.182