JOB VACANCY RELATION WITH LABOUR INPUTS AND UNEMPLOYMENT: PRELIMINARY EVIDENCE FROM ECONOMIC SECTORS

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Abstract. Job vacancy statistics (JVS) are key leading indicators of the business cycle and are essential for structural labour market analysis, particularly in identifying mismatches between labour demand and supply. Despite their importance, Italy has yet to fully exploit demand-side data or evaluate the predictive capacity of JVS for employment and unemployment trends. This paper investigates whether changes in job vacancy rates can serve as leading indicators of economic activity by analysing their relationship with various labour input indicators, including occupied positions, hours worked, and jobs filled by temporary agency workers. The analysis uses quarterly time series and growth rate comparisons from 2016 to 2024, based on data from three official Istat sources: Employment, Wages, Salaries, and Social Contributions; Job Vacancies and Hours Worked; and Labour Force. A central component is the construction of Italy's Beveridge curve to explore the dynamics between labour demand and supply. Results indicate that, overall, the vacancy rate leads labour input growth by one quarter, though some sectors show contemporaneous relationships. The findings also reveal both cyclical and structural shifts in the vacancy-unemployment relationship, laying the groundwork for future modelling of job matching dynamics.

1. The JVS Survey within the labour market framework

The labor market is shaped by the constant interaction between the supply and demand for labor. Supply is represented by individuals seeking work, while demand is expressed by enterprises needing employees. Employment outcomes result from the alignment of these two forces through job matching, which determines the efficiency of resource allocation. This interaction creates three main areas of analysis. The first is the matched segment, where supply meets demand. This segment, covering the number of employed individuals and hours worked, is a key indicator of market performance. The other two areas highlight unmet needs: unemployment (individuals seeking work but unable to find it) and job vacancies (open positions without suitable candidates). These imbalances signal structural or cyclical issues that hinder efficient resource allocation.

To understand the full complexity of the labor market, it's crucial to adopt a dual perspective, analyzing both individual behaviors and enterprise decisions. This

approach requires data from both households and businesses to measure not only employment but also vacancies, hours worked, and job quality. This integrated view helps identify mismatches between skills and demand, as well as broader socioeconomic dynamics.

The provision of timely, accurate, and harmonized labour market statistics is fundamental for economic analysis, policymaking, and business strategy at both national and European levels. A key instrument in this domain is the quarterly Job Vacancy and Hours Worked Survey (JVS), a comprehensive statistical framework designed to measure critical labour market dynamics. The survey provides indispensable data on labour demand, labour input, and emerging economic pressures, adhering to stringent European Union regulations while also generating valuable national-level indicators.

The JVS is a quarterly sample survey designed to be representative of the private non-agricultural industry and service sectors. The target population consists of active enterprises and private institutions resident in the national territory with an employment size ranging from 1 to 499 employees. The survey operates with a substantial sample of approximately 29,000 enterprises. This sample is strategically stratified to ensure robust estimates, comprising around 16,000 enterprises with fewer than 10 employees and approximately 13,000 enterprises in the 10-499 employee range. To maintain the statistical validity of the panel over time while minimizing the response burden on individual units, the sample is rotated by one-third annually. This rotational design ensures that two-thirds of the sample remains consistent between consecutive years, thereby improving the accuracy of year-on-year comparisons.

The survey's economic scope is defined according to the NACE Rev. 2 statistical classification of economic activities. It covers sections from B (Mining and quarrying) to S (Other service activities), comprehensively encompassing the majority of the private industry and service economy. Notably, it excludes section A (Agriculture, forestry and fishing) and section O (Public administration and defence; compulsory social security), which are outside its primary focus.

Data collection is conducted using a modern, efficient methodology. The primary instrument is a quarterly questionnaire administered via Computer-Assisted Web Interviewing (CAWI). Respondents access and complete the questionnaire through the official ISTAT Business Portal, a secure online platform. This approach facilitates timely data submission and has proven effective, yielding a high response rate of approximately 70%.

The survey captures the total number of job positions by measuring the stock of employees at the end of both the reference quarter and the previous quarter. This longitudinal element is supplemented by flow data, which includes workers who both started and ended their employment during the reference quarter.

The definition of a job vacancy is strictly aligned with EU Regulation. A job vacancy is defined as a paid post that is newly created, unoccupied, or about to become vacant for which the employer is taking active steps to find a suitable candidate and intends to fill either immediately or within a specific period of time. The survey further specifies that a vacancy exists at the point where a suitable candidate could have started working immediately. An additional qualitative dimension is captured by identifying vacancies for which enterprises report particular difficulties in finding suitable candidates, offering insight into skills mismatches in the labour market.

The concept of hours worked is disaggregated into three primary components to provide a detailed view of labour input: ordinary hours; overtime hours; hours paid but not worked. Furthermore, the survey monitors key indicators of labour underutilization. It collects data on hours lost due to strikes, for reasons both related and unrelated to the specific employment relationship. It also measures the impact of state-supported schemes through the short-time working allowance, a government instrument providing financial support when businesses are forced to downsize or suspend activities. This includes ordinary, exceptional, and extraordinary interventions. Finally, it quantifies the reduction of working hours resulting from the application of solidarity contracts (as per Law 863/84).

To enhance the robustness of its estimates and provide a complete picture of the economy, the JVS integrates data from other key statistical sources.

For enterprises with 500 or more employees, which are outside the direct scope of the JVS sample, the survey incorporates micro-data on employees, hours worked, and job vacancies from the Monthly Large Enterprises Survey (LES). This integration ensures that the final estimates reflect the entire business economy. Additionally, the JVS utilizes both micro-data and macro-data on job positions from the Quarterly Survey on Employees, Gross Wages and Social Contributions (OROS). This information is crucial for estimation and calibration processes, ensuring the final survey weights accurately reflect the structure of the target population.

The JVS produces a series of key statistical outputs with staggered release-timetables, adhering to the requirements of European regulations. The main outputs include:

- Flash Job Vacancy Rate: preliminary estimates are released within 45 days of the end of the reference quarter, providing an early signal of labour market tightness.
- Final Job Vacancy Rate: the definitive rate is published within 70 days, in compliance with Regulation (EC) No 453/2008.

- Total Hours Worked: comprehensive data on hours worked is disseminated within 90 days, following the framework of Regulation (EU) No 2019/2152 on European business statistics.

The indicators produced are particularly relevant to the labour market. Notably, the Job Vacancy Rate is included among the Principal European Economic Indicators (PEEIs) — a set of key macroeconomic indicators that provide timely and high-quality information for monitoring short-term economic developments of the European Union (EU) and the euro area.

In addition to the above-mentioned indicators, required by Eurostat, the survey generates a set of valuable indicators for national-level dissemination. These include per capita hours worked, overtime hours as a percentage of total hours worked, and the rate of short-time working allowance hours per 1,000 hours worked, offering deeper insights into productivity, work intensity, and the economic cycle.

2. The relation between vacancies and labour inputs

In the short term, labour demand is closely linked to fluctuations in enterprise output. When production increases, firms initially respond by extending the working hours of current employees, both through ordinary and overtime hours. If the growth in output persists, businesses initiate new recruitment activities, which eventually lead to a rise in employment levels. This sequential response introduces a temporal gap between the initial rise in output and the actual hiring of additional staff, during which job vacancies emerge.

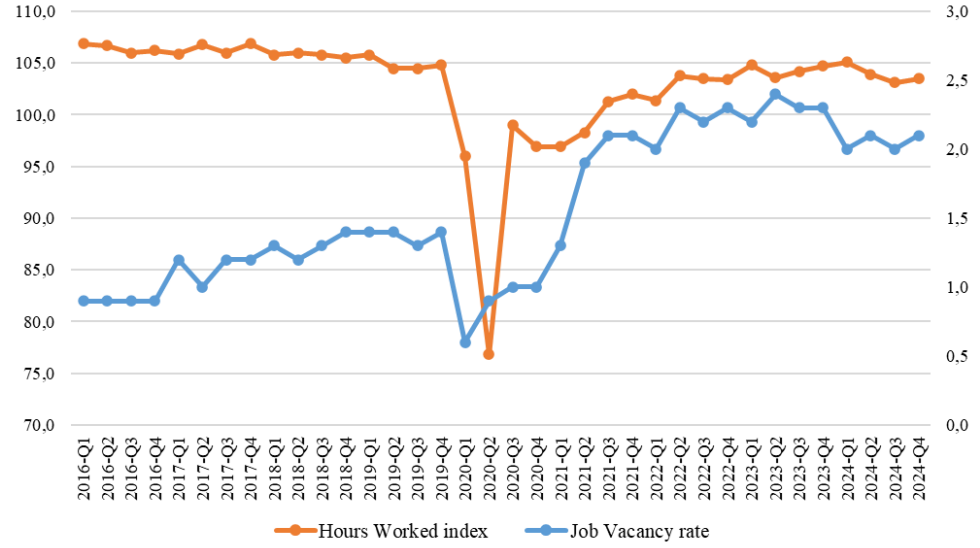
Job vacancies thus function as an intermediate stage in the adjustment of labour inputs and serve as early signals of forthcoming employment changes. Because they reflect the hiring intentions of firms, vacancies are particularly valuable as short-term indicators of economic activity. An observed increase in vacancies often anticipates a rise in employment in subsequent periods, making them a key variable for economic forecasting. Job vacancy statistics, therefore, play a critical role in linking short-term economic dynamics to labour market adjustments.

Building on this theoretical relationship between labour demand and labour inputs, this section delves into the empirical connection between job vacancies, hours worked and employment. A key mechanism through which firms respond to short-term fluctuations in labour demand, particularly during periods of economic expansion, is by adjusting regular working hours before altering headcount.

Figure 1 illustrates the strong correlation between changes in per capita hours worked and the job vacancy rate, a widely used proxy for labour demand. This dynamic adjustment was particularly pronounced during the COVID-19 pandemic. In the early stages of the crisis, total hours worked declined sharply, mirroring the

abrupt drop in labour demand triggered by widespread lockdowns. As economic conditions began to stabilize, firms quickly increased hours worked to meet rising demand, even before significantly expanding their search for new workforce.

Figure 1 – *Quarterly Job Vacancy rate (right scale) vs per capita Hours Worked index. Seasonally adjusted data 2016-2024; NACE Rev.2 sectors B to S; 1+ employees.*



Source: JVS.

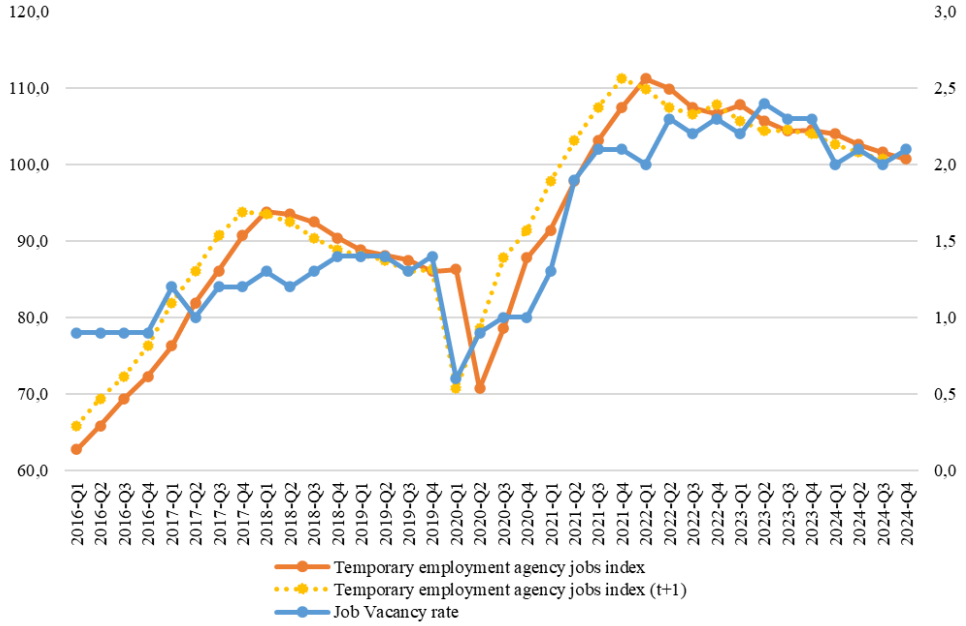
From the third quarter of 2021 onward, hours worked once again began to closely align with movements in the vacancy rate, reflecting a normalization of labour market dynamics. This pattern underscores the role of working hours as a flexible and immediate response tool for firms managing emerging needs in labour demand.

Following the previously discussed dynamics of per capita hours worked, which similarly reflect firms' short-term responses to shifting labour demand, this section turns to the next stage in the labour input adjustment process: the use of temporary agency work. This form of employment offers firms a flexible means of scaling labour capacity in response to cyclical fluctuations, particularly when demand increases are perceived as potentially transitory.

Figure 2 presents a comparison between the job vacancy rate and the temporary employment agency jobs index, examined both contemporaneously and with a one-quarter lag applied to the latter. The time series analysis reveals a clear pattern: the vacancy rate consistently functions as a leading indicator for other labour input measures. The delayed response observed in temporary agency work highlights how

firms initially rely on job postings and internal labour adjustments, such as regular and overtime hours, before expanding their use of external, flexible labour arrangements.

Figure 2 – *Quarterly Job Vacancy rate (right scale) vs Temporary employment agency jobs index. Seasonally adjusted data 2016-2024; NACE Rev.2 sectors B to S; 1+ employees.*



Source: JVS and OROS.

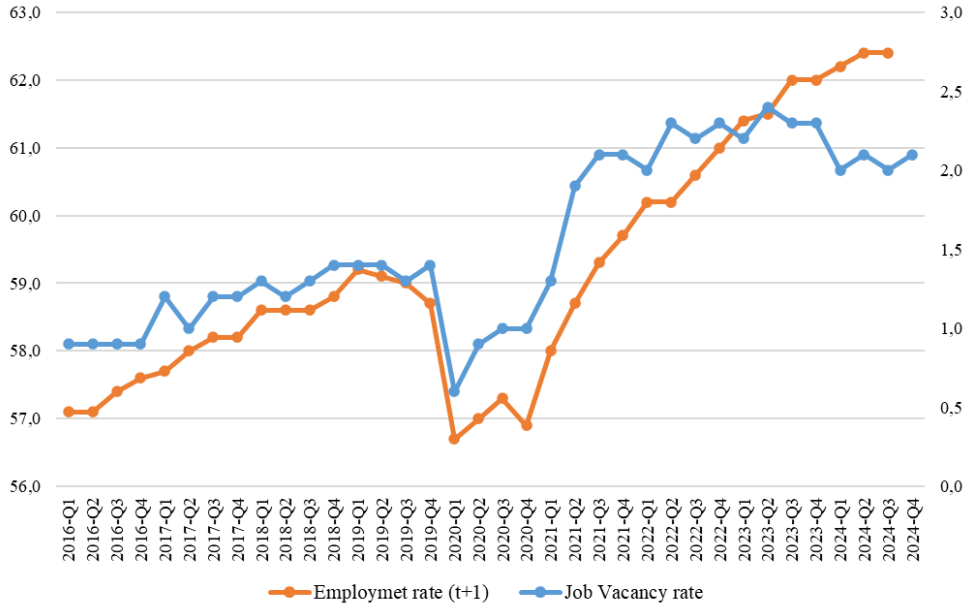
This relationship is especially evident in the periods both preceding the COVID-19 pandemic and following the onset of 2022, during which the lagged temporary agency jobs index aligns closely with movements in the vacancy rate. The coherence underscores the instrumental role of temporary employment in firms' adaptive strategies during economic recovery and expansion phases.

The last relationship explored in this section concerns the link between job vacancies and overall employment. This relationship can be examined through two lenses: the number of individuals employed or the total number of job positions. Both approaches offer valuable insights into how shifts in labour demand translate into realized employment outcomes.

Figure 3 illustrates the employment rate with a one-quarter lag, allowing for a clearer view of the temporal relationship between labour demand and subsequent employment developments. The data reveal a consistent pattern: changes in the job

vacancy rate tend to precede corresponding movements in employment, typically with a lag of approximately one quarter. This suggests that job postings are a reliable early signal of hiring trends, reflecting firms' forward-looking behavior in response to evolving economic conditions.

Figure 3 – *Quarterly Job Vacancy rate (right scale) vs Employment rate (15-64 years). Seasonally adjusted data 2016-2024; JV rates for enterprises in NACE Rev.2 sectors B to S and with at least 1 employee.*



Source: JVS and LFS.

Although the figure focuses on the employment rate, similar conclusions hold when analyzing the total number of job positions. Due to space constraints, the corresponding graph for job positions is not included here, but the underlying dynamics remain consistent: both metrics reinforce the role of vacancies as a leading indicator in the employment adjustment process.

To provide a comprehensive overview of the results discussed above, Table 1 reports the cross-correlations between the job vacancy rate and different labor input measures at various time lags. For completeness, the correlation with the unemployment rate is also included and will be examined in greater detail in the following section.

The results indicate that the correlation between job vacancies and hours worked peaks at a one-quarter lag. A similar pattern is observed for the other labor input

indicators. Specifically, the use of temporary agency work is strongly associated with job vacancy dynamics, reaching the highest correlation at t+1. The leading role of the job vacancy rate with respect to employment dynamics is likewise evident, as the correlation between the two series reaches its maximum values starting from a one-quarter lag. Finally, the inverse correlation with the unemployment rate highlights a consistent relationship between rising labor demand and falling unemployment. This relationship is statistically strong at a one-quarter lag and strengthens further over the next two quarters.

Table 1 – *Cross-Correlations among Job Vacancy rate with labour inputs and Unemployment rate at different time lags.*

	Hours Worked index	Temporary employment agency jobs index	Employment rate	Unemployment rate
t-3	-0.14	0.77	0.51	-0.68
t-2	-0.03	0.85	0.63	-0.71
t-1	0.04	0.88	0.73	-0.75
t0	0.15	0.89	0.83	-0.78
t+1	0.24	0.90	0.90	-0.82
t+2	0.09	0.81	0.91	-0.88
t+3	0.13	0.70	0.91	-0.87

While the aggregate relationship between labour demand and employment is well established, a sectoral analysis offers valuable insights into how this dynamic may differ across distinct areas of the economy. Examining labour market adjustments at the sectoral level allows for the identification of structural or behavioral factors that may influence the responsiveness of employment to changes in labour demand.

To this end, the analysis focuses on the degree of alignment over the reference period between short-term fluctuations in the job vacancy rate and the corresponding percentage changes in the employment index across NACE Rev. 2 sections. This comparison enables a more nuanced understanding of how labour demand translates into employment outcomes in different economic contexts.

Figure 4 draws attention to two sectors in particular where this relationship appears especially robust: Section C (Manufacturing) and Section J (Information and Communication). In both sectors, more than in others, employment dynamics closely track movements in job vacancies, suggesting a heightened sensitivity of filled positions to shifts in labour demand. One plausible explanation for this strong correlation lies in the high concentration of skilled labour in these sectors. Highly qualified workers typically face fewer barriers to mobility and are often better positioned to respond swiftly to new opportunities.

Figure 4 – *Job Vacancy rate vs Total Jobs index in Manifacturing and Information and Communication sectors. NACE Rev.2: C, J; 1+ employees; absolute differences and percentage changes over the previous quarter.*

Source: JVS and OROS.

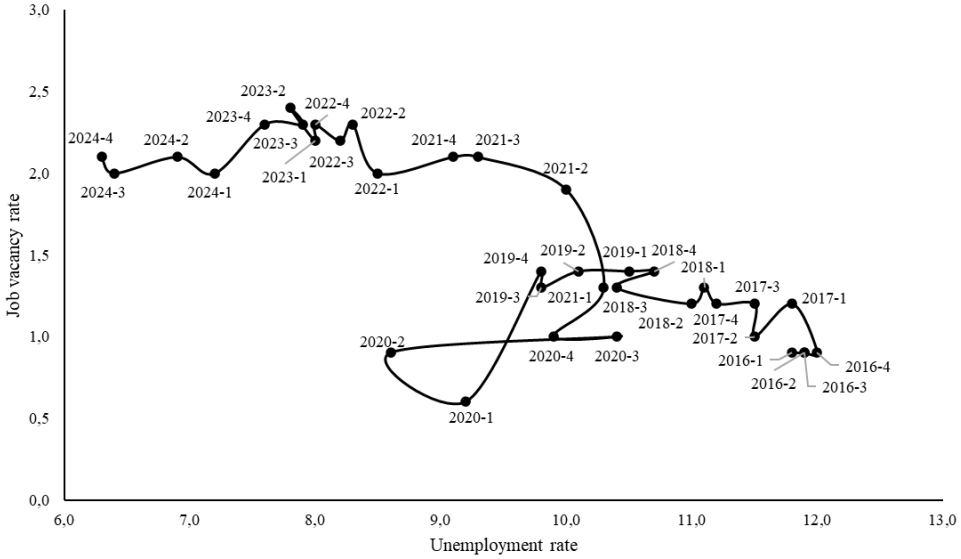
3. Job vacancy and unemployment: the Beveridge curve for Italy

While the relationship between job vacancies and various labour inputs has been analyzed in the previous section, further investigation is needed into the implications

of mismatches between labour demand and supply, particularly in relation to unemployment.

A widely used analytical tool for exploring this relationship is the Beveridge Curve, which graphically illustrates the inverse relationship between the unemployment rate and the job vacancy rate. It is a standard instrument in labour economics for assessing the efficiency of labour market matching, also making possible to assess whether the dynamics of vacancies and unemployment reflect cyclical movements.

Figure 5 – *Job vacancy and Unemployment rates (15-64 years): Beveridge Curve. Seasonally adjusted data 2016-2024; JV rates for enterprises in NACE Rev.2 sectors B to S and with at least 1 employee.*



Source: JVS and LFS

As shown in Figure 5, in the Italian labour market over the period 2016–2024, a general trend of improved matching between labour demand and supply can be observed, particularly following the economic recovery after the double-dip recession[1]. Between 2016 and 2019, the unemployment rate steadily declined while labour demand increased, reflecting a phase of cyclical recovery accompanied by improved labour market efficiency. In 2020, the job vacancy rate dropped sharply due to the pandemic, although this was not immediately followed by a rise in unemployment, thanks to policy interventions such as dismissal bans.

With the gradual return to normality, the period from 2020 to 2021 saw a brief

[1] An analysis of the Beveridge curve for years 2008-2017 in Italy can be found in Istat *et al*. (2017).

uptick in unemployment, followed by a sharp and sustained decline beginning in 2021. At the same time, labour demand began to recover from late 2020 onward, with the job vacancy rate rising steadily through the end of 2023. In 2024, labour demand appeared to level off, but this stabilization did not reverse the downward trend in unemployment, which continued to fall, albeit at a slower pace.

This pattern — also reflected at the European level (Eurostat, 2025) — may point to a phase of relative efficiency in labour market matching, even amid slower job creation. Several factors could help explain this development: improved job search behavior among the unemployed, more targeted and effective recruitment strategies by employers, better alignment between available skills and job requirements, or a reduction in frictional unemployment due to enhanced information flow and mobility.

4. Conclusions

This study has examined the Italian labour market through the lens of the Job Vacancy and Hours Worked Survey (JVS), highlighting the critical role of job vacancies as both indicators of firm-level labour demand and predictors of broader employment dynamics. By integrating data from multiple sources and employing a harmonized statistical framework, the JVS provides a comprehensive view of labour input adjustments, including hours worked, temporary agency work, and changes in overall employment.

First, a robust positive correlation was established between the job vacancy rate and hours worked, highlighting that firms initially respond to shifts in output demand by adjusting the hours worked of their existing staff. This represents the most immediate and flexible margin of labour input adjustment. Subsequently, the analysis demonstrated that the job vacancy rate also precedes changes in temporary agency employment, typically with a temporal lag of one quarter. This sequential adjustment process reveals that after exhausting internal flexibility, firms turn to external, non-permanent staffing solutions. Ultimately, the study confirmed that job vacancies are a reliable leading indicator for overall employment, with changes in the vacancy rate consistently anticipating movements in the employment rate by approximately one quarter. This relationship was found to be particularly pronounced in skill-intensive sectors such as Manufacturing (NACE Rev. 2 section C) and Information and Communication (NACE Rev. 2 section J), suggesting that labour mobility and market responsiveness are heightened where specialized qualifications are in demand.

Beyond the direct relationship with labour inputs, the analysis extended to the broader interplay between labour demand and supply through the lens of the

Beveridge Curve. The examination of the vacancy-unemployment relationship in Italy from 2016 to 2024 revealed a notable improvement in the labour market's matching efficiency. Despite the significant economic shock induced by the COVID-19 pandemic, the curve's trajectory indicates an enhanced capacity to align job seekers with available positions, particularly during the post-pandemic recovery phase. This inward shift of the Beveridge Curve suggests that factors such as more effective recruitment strategies, improved skills alignment, or reduced frictional unemployment have contributed to a more efficient structural performance of the Italian labour market.

In summary, the converging evidence from the analysis of hours worked, temporary employment, aggregate employment levels, and the Beveridge Curve collectively affirms the central role of job vacancy statistics in labour market analysis. This encouraging preliminary body of evidence, which assesses and confirms that changes in the number of vacancies are a leading indicator, with a one-quarter lag, of labour input dynamics, paves the way for future research and analysis. In particular, applying multivariate time-series methodologies, such as vector autoregressive and error correction models, offers a promising way to capture the dynamic interdependencies among vacancies, hours worked, and employment. This will therefore be useful for monitoring and predicting labour market developments with greater precision.

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