

# Analysing the labour market; a tension gauge



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Discussion paper (201205)



Statistics Netherlands

The Hague/Heerlen, 2012

## Explanation of symbols

|                       |                                                                                  |
|-----------------------|----------------------------------------------------------------------------------|
| .                     | data not available                                                               |
| *                     | provisional figure                                                               |
| **                    | revised provisional figure (but not definite)                                    |
| x                     | publication prohibited (confidential figure)                                     |
| —                     | nil                                                                              |
| —                     | (between two figures) inclusive                                                  |
| 0 (0.0)               | less than half of unit concerned                                                 |
| empty cell            | not applicable                                                                   |
| 2011–2012             | 2011 to 2012 inclusive                                                           |
| 2011/2012             | average for 2011 up to and including 2012                                        |
| 2011/'12              | crop year, financial year, school year etc. beginning in 2011 and ending in 2012 |
| 2009/'10–<br>2011/'12 | crop year, financial year, etc. 2009/'10 to 2011/'12 inclusive                   |

Due to rounding, some totals may not correspond with the sum of the separate figures.

### Publisher

Statistics Netherlands  
Henri Faasdreef 312  
2492 JP The Hague

### Prepress

Statistics Netherlands  
Grafimedia

### Cover

Tel design, Rotterdam

### Information

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Telefax +31 70 337 59 94  
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ISSN: 1572-0314

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# **Analysing the labour market; a tension gauge**

**Floris van Ruth<sup>1</sup>**

*Summary: A graphical tool is presented for coherently analysing labour market developments. It works by plotting indicators of relative development of the supply and demand for additional labour against each other, using their interaction to define labour market tension. This results in a robust characterization of the labour market in one of four states, characterized by the amount of tension in the labour market. Each labour market state corresponds to a different balance between the supply of additional labour and the demand for it, and each represented by one of the quadrants of the labour market tension gauge. By plotting this in a graphical tool, an easy to interpret general characterization of the labour market situation is obtained. This also allows for further analysis and the introduction of dynamic features. It is shown that composite and filtered indicators of labour demand and supply perform better than simple indicators such as unemployment and vacancies.*

*Keywords: Labour market, labour supply, labour demand, short term indicators, wage development, business cycle analysis*

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<sup>1</sup> The author would like to thank Leendert Hoven, Alex Lammertsma and the participants of the Dutch business cycle study day 2009 for discussion and comments.

## 1. Introduction

The labour market is the aspect of the economy which has the most profound impact on people's lives. Developments on the labour market influence job security and job prospects, central to people's well being and future plans. But they are also key to analysing and tracking the business cycle. Wages, labour costs, jobs and vacancies are important both as drivers and indicators of business cycle developments. Developments in the labour market discern temporary economic fluctuations from real business cycle changes. It is therefore that the question "what is the current state of the labour market" is of such importance. Not surprisingly, in most developed economies a whole range of statistics related to the labour market is available. But no individual statistic will be able to give an accurate picture of the state of the labour market. Only by confronting various relevant indicators with each other, and in a structured manner, will one be able to obtain an analysis of the general situation. In such structured, or coherent, indicator sets, each indicator supplies a piece of the puzzle, and only by combining these bits of information will the whole become visible. Thus, new and previously unavailable information is created. By comparing the realisations of the selected indicators, it will become much clearer how developments in individual statistical indicators should be interpreted, and what the significant developments are. As the labour market is, obviously, a market, it is natural that its state is determined by the interaction of the supply for labour and the demand for labour [Bridgen and Thomas]. This study presents a tool which is developed for coherently analysing labour market developments. The focus is on short to medium term developments, on the dynamics of the labour market related to the business. Thus, more long term and structural changes are abstracted from.

Here, the defining characteristic of the state of the labour market is deemed to be its tension. Labour market tension as defined here is not an independently observable variable, but the result of the interaction of the supply and demand for labour. This is how it differs from labour market tightness, the traditional term used to characterize the labour market. Though ill-defined, labour market tightness usually refers to the availability of labour, characterized by unemployment or employment trends. Thus, it is largely a supply-based approach, which can only result in a partial analysis of the labour market. For a comprehensive analysis of the state of the labour market, one should consider both demand for and supply of labour. Moreover, when actually viewed as a *market*, the labour market is defined by the demand for and supply of *additional* labour. This means all labour desired in addition to the current workforce and available unused labour supply. Focussing on additional labour desired and available is a crucial, but also natural distinction to make. Markets are usually characterized by developments at the margin, where marginal demand is confronted with marginal supply. This is also where tension, or more traditionally

formulated tightness, materializes. Focusing on the demand for additional labour and the available supply of unused labour also fits well with focussing on the business cycle related dynamics of the labour market. Thus, for a well-specified analysis of the dynamic state of the labour market, one needs to consider the demand for additional labour and the available supply of additional labour. An important by-product of this approach is the emergence of labour market tension, which results from the balance between the additional demand and supply.

“The state of the labour market” as defined above yields of course a business cycle - point of view analysis of the labour market, which means that the central issue is analysing whether the labour market is “tense” or “loose”. Long term trends in labour supply, participation and issues like skills mismatches are ignored. The tool proposed here can actually be used to define the concept of “labour market tension” more rigorously, and structuring its interpretation and analysis. A tense labour market of course means a high number of vacancies, low unemployment, high growth, with a loose labour market being the opposite. But these are two extreme situations, what happens in between, and when exactly does a labour market *become* tense or loose, and for that matter why. A more structured analysis of labour market developments can help answer these questions. The tension of the labour market will be tracked by the evolving interaction between supply and demand for additional labour, resulting in a more precise and nuanced definition. This indicates that two sets of statistical indicators will be needed to characterise the state of the labour market, one representing the strength of the demand for additional labour, the other representing the strength of the supply of additional labour.

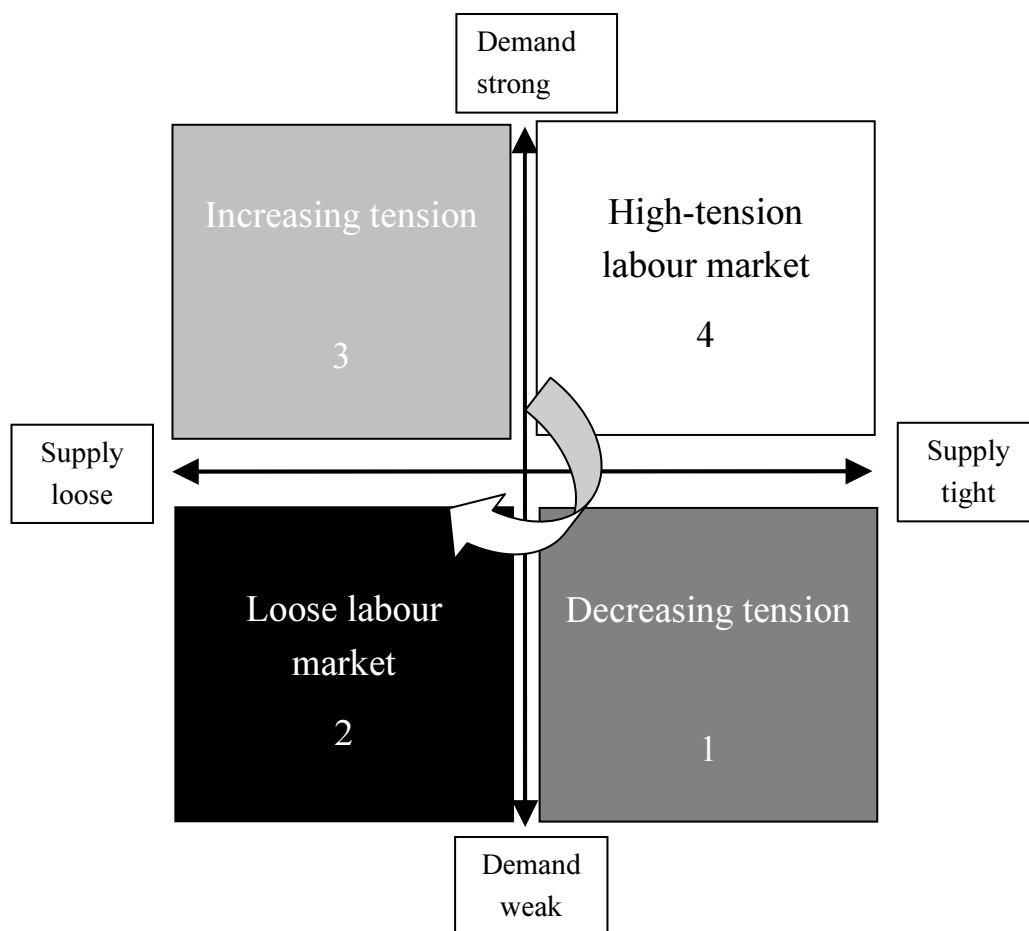
## 2. The concept

Labour market tension, or the state of the labour market is not a quantity which can be measured directly. It is the result of the interaction between supply and demand for additional labour. For example, an increase in the demand for labour does not automatically equate with a (more) tense labour market. If at the same time there is ample supply of additional labour, i.e. when a *relatively* small fraction of the labour force is employed, it will not immediately lead to staffing problems or wage pressure [Bridgen and Thomas]. Thus, by confronting, in a structured manner, quantitative indicators of supply and demand, new information is gained and a new statistical concept is created, labour market tension.

It is important to note that here labour market developments and labour market tension are analysed from a business cycle point of view. This means that the focus is not on structural, long term developments in the labour market, such as shortages of skilled workers, ageing, participation etc. The influence of the business cycle on the labour market is well known, see for example [Kranendonk]. The aim is to correctly identify and analyse periods of high and low labour market tension which occur on medium-term frequencies. In the framework proposed here, characterizing the state of the labour market can be achieved by analyzing in combination whether labour supply is relatively tight or loose, and whether labour demand is relatively strong or weak. There are three key concepts in the previous sentence; “labour supply tightness”, “strength of labour demand” and “relatively”. Each will have to be defined more precisely and made operational. But first it will be instructive to illustrate in general how such an analysis would work.

The finished product will be a graphical tool, and the concept is easiest explained using the relevant diagram. In this diagram, one axis (horizontal) will represent the tightness of labour supply, the other (vertical) the strength of demand for additional labour. By using the computed values of supply of and demand for additional labour as coordinates, a position in the diagram results which characterises the state of the labour market. A great advantage of using this graphical tool to perform this analysis of the labour market, is that it is easy to interpret and more objective in its outcomes. It is much easier to get a general picture of the state of the labour market from a purpose-built diagram than from a set of graphs and tables. This global picture can then serve as a guide when consulting the actual labour market statistics.

Diagram 1; The labour market tension gauge and corresponding labour market states



Note that this approach does not aim, and even cannot, quantify the state of the labour market by yielding a numerical value for labour market tension. Instead it relies on a general characterization into four different states, which is far more robust as it will not depend on small variations in the values of the indicators.

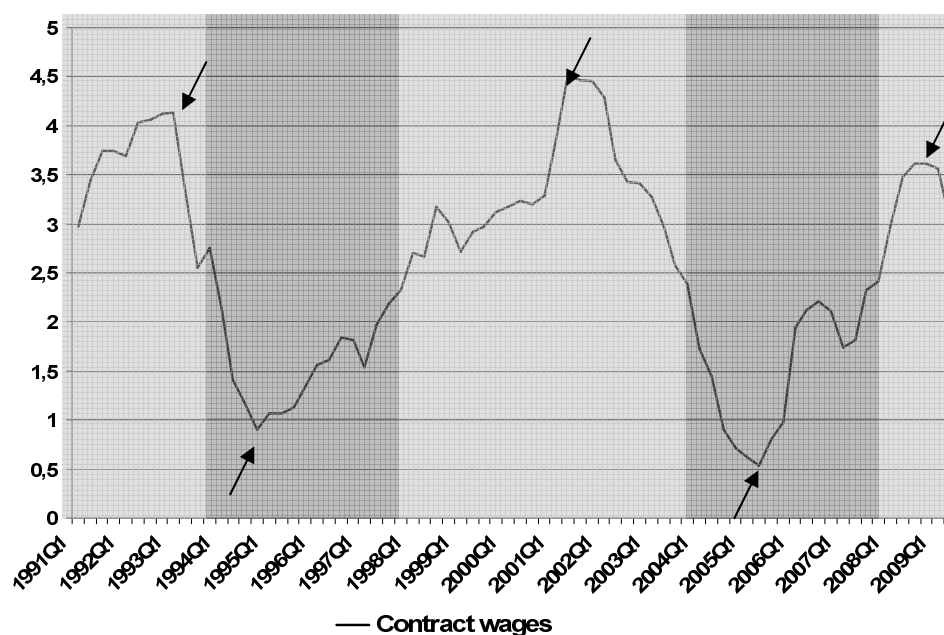
Table 1; different labour market states and their characterization.

| <i>Labour market</i>          | <i>Supply of additional labour</i> | <i>Demand for additional labour</i> | <i>Economic conditions</i> |
|-------------------------------|------------------------------------|-------------------------------------|----------------------------|
| (2) <b>Loose</b>              | Loose                              | weak                                | weak                       |
| (3) <b>Increasing tension</b> | still loose                        | picking up                          | improving                  |
| (4) <b>High tension</b>       | tight                              | strong                              | favourable                 |
| (1) <b>Decreasing tension</b> | still tight                        | falling of                          | deteriorating              |

It should be clear from the arrow in the diagram and the description of the labour market states that a certain standard chronology of labour market developments is expected. This follows the business cycle, where states of low economic activity and high unemployment tend to evolve via a picking up of economic activity into boom states where growth is high, as is demand for additional labour, while supply of additional labour supply is tight. It should be stressed here that the working of the labour market tension gauge does not depend on this scenario being followed. Even in the unlikely event that the labour market would develop completely independent of the business cycle, the gauge could still be used to analyse and characterise the labour market. But the concept is easier to understand and interpret when using the link with the business cycle chronology.

So labour market tension has been defined as the interaction between the supply of and demand for additional labour. But a benchmark is needed to assess the quality and credibility of the outcomes of the proposed labour market tension gauge. Here, wage development will be used, to be more specific the year on year growth rate in contract wages.

*Graph 1; Wage development 1991-2007; relative year on year growth rate of nominal contract wages, with periods of high(light shading) and low (dark shading) growth and turning points.*

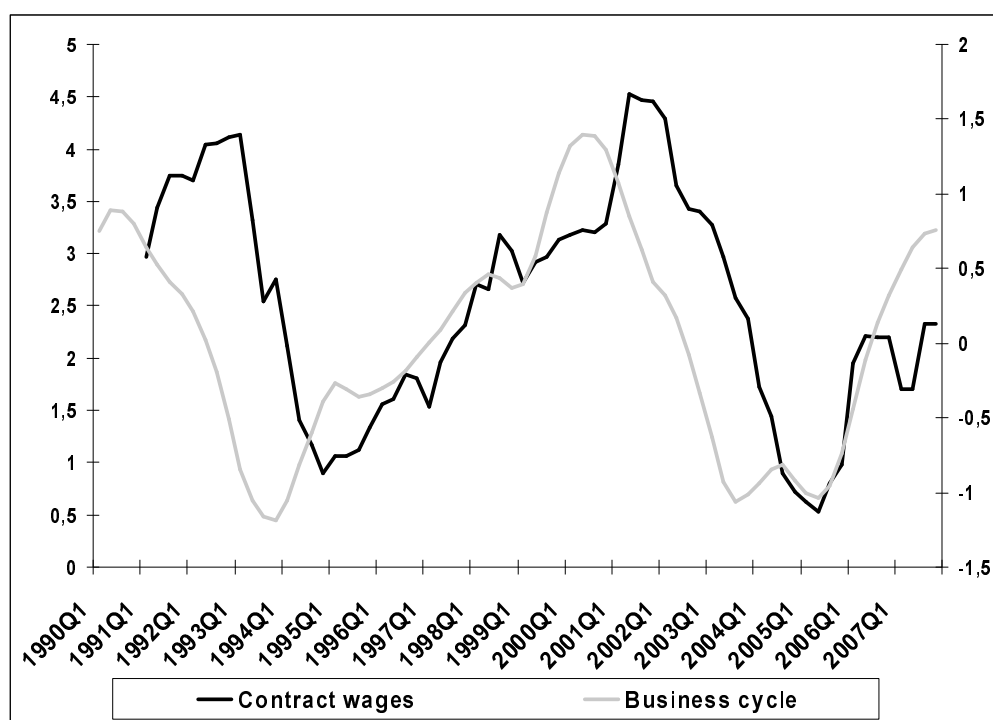


The logic is simple, sooner or later developments in labour market tension will have to appear in wage development. Tight supply of labour, and high demand should result in higher wage growth. More elaborate foundations are given in the appendix, where it is also explained why nominal wages are a superior reference here than real wages. In the Netherlands, for large parts of the economy contract wages are determined via collective bargaining, thus yielding an excellent indicator for the

overall trend in wage development. In graph 1 the development in contract wages in the Netherlands since 1991 is shown. The following analysis will show how wage development will be used here to assess the performance of the labour market tension gauge.

There is a clear, and remarkably smooth, cyclical pattern in the growth rate of contract wages. This pattern has two main features which are of interest and which will become more relevant later. Firstly, there are alternating periods, lasting several years, of relatively high and low wage growth. These are indicated by the differently shaded areas. Secondly, wage development exhibits distinct and sharp turning points, indicated in the graph by arrows. There is a maximum in 1993, followed by a minimum at the end of 1994, again a maximum in 2001 and finally a minimum in 2005. The existence and nature of these turning points suggests that at those points in time, a non-trivial change in labour market conditions occurs. It seems reasonable to require that a labour market tension gauge, a tool for analysing developments in the labour market, will be able in some manner to identify these defining characteristics of the labour cycle, and give a credible analysis of the underlying patterns responsible for the observed developments, such as the turning points.

*Graph 2; Wage development (growth rate of contract wages, left axis) compared to the Dutch business cycle according to the Statistics Netherlands business cycle tracer (standardised, right axis).*



A final relevant observation on wage development arises from its distinct cyclical pattern, which is remarkably like a business cycle chronology. It is illuminating therefore to compare wage growth with the Dutch business cycle, as found by the Statistics Netherlands business cycle tracer. Graph 2 shows clearly that the pattern of

contract wage development is remarkably like the business cycle, but with a lag. Wage development exhibits the same peaks and troughs as the business cycle, but generally one to two years later. This supports basing the analysis of the labour market on periodic changes in economic activity and cyclical changes in available labour.

Taking into account the observed properties of wage development and the objectives for the labour market tension gauge stated earlier, the following general requirements can be formulated for the tool:

- The evolution of labour market tension should be relatively smooth and cyclical, as is the case for wage development.
- The gauge should be able to give an explanation for the occurrence of turning points, in terms of changing labour market conditions. And following from this, the gauge should be able to identify these turning points reliably and timely.
- The gauge should allow an analysis of labour market conditions in terms of developments in supply and demand for additional labour.
- Labour market tension as identified by the gauge should reflect developments in contract wages.
- The classification of the state of the labour market should be robust; e.g. little or no short term fluctuations in the classifications, and not too sensitive to small changes in individual component indicators.
- (changes in) The state of the labour market as found by the labour market gauge should be logical given the state of the economy and wage development at that time.

### **3. Some theoretical considerations**

It is useful to examine if and in how far the analysis pioneered here matches theoretical descriptions of labour market phenomena, and whether the patterns observed can be explained by these theories. The labour market tension gauge proposed here is not based explicitly on any theory of the labour market, except for the notion that the labour market is a market, and thus should be analysed using both the supply of and demand for (additional) labour. The tool is meant to facilitate a comprehensive analysis of developments on the labour market, whilst imposing a minimum of pre-determined structure on possible labour market developments. Even so, it would be good if existing theories of the labour market can offer some explanation for its outcomes.

In neo-classical economic theory, central concepts in the basic analysis of the labour market are the Phillips curve and the non-accelerating inflation rate of unemployment (NAIRU). The underlying theory of the NAIRU states that labour demand depends on the expected difference between sales prices and the wage rate (in essence the profit margin), whilst labour supply depends on the expected real wage [Layard et al.]. In these models, there is a direct link between (expected) output and employment. Unemployment works to balance labour supply and demand. In one interpretation, unemployment is always voluntary and the labour market always clears, meaning that labour supply and demand are in balance. The Phillips' curve states that there is an inverse relationship between unemployment and inflation. This is actual a reflection of a more complex mechanism in which causality runs from aggregate demand via output and unemployment to inflation [Phelps]. If aggregate demand is above its equilibrium value, output will rise and the additional demand for labour will force the unemployment rate under the NAIRU, resulting in wage and price increases. These models point to a clear relationship between demand/output and labour demand, which is relevant for analysing labour market tension. But these models do have difficulty in giving a credible explanation for the existence of unemployment, as well imbalances between supply and demand for labour. Therefore, more detailed models of the functioning of the labour market have been developed.

A very useful study in this respect is that of Bridgen and Thomas. It describes how different models of the labour market can explain changing balances between labour supply and demand and what are then the consequences. They do base their analysis of the labour market on a definition of labour market tightness which is in keeping with the theories described above. In their definition, labour market tightness can only arise when the labour market is out of equilibrium, which according to conventional economic theory can only happen due to temporary shocks. Thus from this point of view, the labour market can only be tight (loose) when either labour supply is lower (higher) than its equilibrium value, or labour demand is higher

(lower) than its equilibrium value. The assumption that equilibrium is the ground state of the labour market is not used here in this study. The tool developed here should be able to analyse and characterize the labour market at all times, allowing for richer dynamics. This might limit the usefulness of the paper of Bridgen and Thomas for explaining the observed phenomena. There is agreement though on the fact that the labour should be analysed in terms of both labour demand and supply. Also, they focus on labour market tightness, which in this study only characterises labour supply, whereas labour market tension is used to describe the (im)balance between supply and demand. This might be a little confusing. On the whole though, the overview given in the study of Bridgen and Thomas of possible mechanisms working in the labour market still gives a lot of insight. Proceeding from their starting point, the study examines in which circumstances different theories of unemployment allow for the existence of tension in the labour market and what then could be its consequences. A consequence of their theoretical approach is that the labour share of income appears as the reference indicator of labour market tightness, instead of wage growth as used in this study.

*Standard competitive model;* In this model firms and workers are price takers in a fully competitive market, and wages and unemployment follow from the equilibrium of labour supply and demand. This means that all unemployment is voluntary, and that in the absence of shocks higher wages will be accompanied by higher unemployment. In effect, labour market tightness does not exist in this model, unless temporary as the consequence of an unexpected shock. In that case, wages can rise and unemployment fall (in case of a positive labour demand shock), but this will only be for a short time until the new equilibrium is reached, at which point labour supply and demand are again in balance.

*Efficiency wages model;* Central to this theory is that firms will pay workers wages above what would be the competitive market rate to stimulate productivity and obtain loyalty. Here again, labour market tightness is temporary, occurring only when certain shocks move the labour market from the old equilibrium to the new. A positive labour demand shock will result in permanently higher wages and lower unemployment.

*Insider power models;* these are based on a model by Layard et al. The model is based on two assumptions; sticky prices and some form of monopoly power of existing staff. These are preferred by firms to unemployed, potential workers, and have therefore a form of bargaining power which enables them to obtain a higher real wage. This model results in more complex labour market dynamics, due to the interaction of price stickiness and workers' bargaining power. Long-term deviations from equilibrium and therefore labour market tightness are not possible, but in the medium term wage-price spirals are possible where (temporary) higher labour demand results in (temporary) higher wages and reduced unemployment.

*Models of skills mismatch;* This type of models differs from the others described here in that it assumes the labour force to be heterogeneous. In its most basic form, it divides the labour force in skilled and unskilled workers. Unemployment changes

and (aggregate) wage changes result from relative changes in labour demand, i.e. shifts in the ratio skilled/unskilled labour. Aggregate changes in labour demand are not a factor here, which is a limitation. A relative increase in demand for skilled labour will result in an average wage rise and rising unemployment, as skilled workers are scarcer and demand higher wages. In the opposite case, an increase in demand for unskilled labour will result in a decline in the average wage and a decrease in employment. These somewhat counterintuitive outcomes indicate that this type of model is only able to explain certain aspects of labour market dynamics.

*Matching frictions models;* These models focus on the process by which firms find workers and workers find or loose jobs. It assumes that matches between workers and vacancies are not instantaneous. Here, labour market tightness is assumed to exist and represented by the vacancy-to-unemployment ratio. The bargaining power of workers depends on the easy with which vacancies can be filled. But labour demand is still assumed to match labour supply, though vacancies can change quickly whilst unemployment is sluggish. This allows for deviations from the steady state. Also, a higher vacancies-unemployment ratio (stronger labour demand-tighter labour market) means higher wages.

Most of the models described above have difficulties with the concept of labour market tension or imbalances. The ground state of the labour market in these models is equilibrium, where labour supply and demand match and wages and unemployment are constant. Departures from equilibrium, the only situations in which unemployment and wages can change, are assumed to be short-term and only possible due to temporary shocks. Most models generally do indicate that an increase in (aggregate) demand will result in demand for *additional* labour. A positive labour demand shocks, i.e. an increase in the demand for labour, will result in (temporary) higher wages and lower unemployment, and of course the reverse for decreases in the demand for labour. In disequilibrium, the wage rate can change. So a possible conclusion is that in equilibrium, labour demand equals labour supply which by definition is the employed labour force, but in disequilibrium, demand for and supply of *additional* labour become relevant. Then marginal demand for, and supply of labour determine labour market and wage rate dynamics. The phenomena observed in this study could then tentatively be explained resulting from a succession of disequilibria. The influence of changes in aggregate demand on the demand for additional labour do support the design of the labour market tension gauge, as does the analysis that labour market tension is related to the balance between unemployment and vacancies. It indicates that supply and demand for additional labour are needed for a full description of the labour market. Most models also indicate some link between labour market tension and the wage rate.

In the concretization of the labour market tension gauge concept, it was chosen to enter the demand and supply indicators in the form of deviations from their average (or trend) development. This could be interpreted as reflecting deviations from equilibrium, though it was not intended so. It is a fundamental choice though. It means that structural changes are ignored, and that the focus is on medium term developments. Medium term typically means business cycle frequencies, though the

functioning of the labour market tightness gauge is independent of whether the labour market tracks the business cycle or not. But in the form chosen here, the tension gauge is best suited for tracking periodic strengthening and weakening of demand for and supply of additional labour, which usually depends on the business cycle. The existence of an equilibrium is not assumed, nor is the absence of tension if the labour market is in equilibrium.

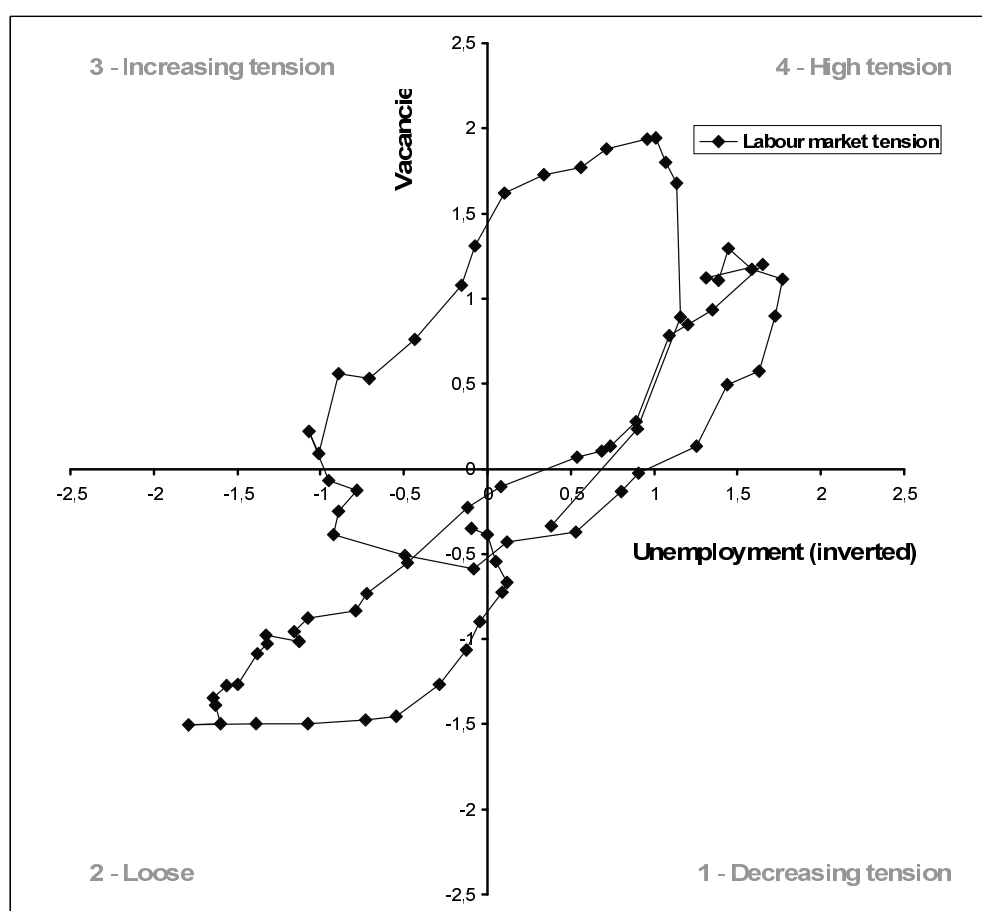
#### **4. The traditional approach**

When assessing labour market developments, most analysts tend to focus on the current developments in one individual indicator, this being jobs, or unemployment or vacancies. As has been argued here, this approach is incomplete and will yield inconclusive results. A more sophisticated approach used is based on considering both the developments in vacancies and unemployment. This comes some way towards the approach proposed here, with vacancies representing the demand for additional labour and unemployment representing the (lack of) supply of additional labour. A prime advantage though of the labour market tension gauge is that it offers a structured method for performing this analysis. A first option therefore is to base the labour market tension gauge on these two indicators, and thus give a more formal structure to the more advanced traditional approach. In this section the performance of the relatively simple set-up using these indicators for labour supply and demand will be tested. This will set a baseline performance with which the outcomes of the more sophisticated indicators proposed later can be compared. Whilst presenting the results here, the opportunity will also be taken to further explain the working of the labour market tension gauge.

Given these two indicators, there are two options for the set-up of the system. The first is entering both vacancies and unemployment in levels, which comes closest to the way in which these statistics are traditionally used. The other possibility is to use growth rates (year on year), which is probably to be preferred as growth rates are better at capturing the dynamics, and will therefore give a more true reflection of the state of the labour market. In both cases the variables will be entered as deviations from their mean value over the period considered. This means that the centre of the diagram will not represent zero development, but mean or “normal” development. For example, a positive value for vacancies (growth) will mean an above average level (growth) of vacancies. This is justified by that the aim is not to find an absolute level of labour market tension or quantify labour market conditions. Instead, the system should visualise the dynamics and show how the interaction between supply and demand dynamics influences labour market conditions. The variables are further standardized by dividing them by their respective standard deviations. This means that all indicators are brought to the same scale. This is useful as it makes combining and comparing different indicators easier, and can easily be justified by the fact that we are not interested in the realisations per se, but in their strength or weakness compared to average conditions and changes therein.

In the diagram below the labour market tightness gauge based on the level of vacancies and unemployment is depicted. In it the evolution of labour market tension between 1990 and 2007 is shown according to these two indicators. Unemployment is entered inverted, as low unemployment means tight supply of labour, in the logic of this diagram a positive realisation.

*Graph 3; Evolution of labour market tension according to labour market tension gauge based on vacancies (standardised level, vertical axis) as labour demand indicator and unemployment (standardised level, inverted, horizontal axis) as labour supply indicator, 1991-2009Q2.*



Note that even though the axis have numbers on them, this diagram **does not** quantify labour market tension. These numbers are purely needed for finding the coordinates of each point in the diagram. Apart from the general classification into four states (corresponding to the four quadrants), it is even difficult to assign relative levels of tension to different realisations at different positions in the diagram. It is tempting to state that a realisation further from the centre means automatically an increase or decrease in tension. But it is not this simple. Of course, if both supply becomes looser and demand weakens, labour market tension will be lower, and given a certain value for labour supply, higher (lower) demand will always mean

more (less) tense conditions. But if supply and demand change both, but in different directions, it is hard to assess what the overall effect will be.

At first sight the results of the analysis in graph 3 are not very good. Though the realisations follow, as expected, a more or less circular path through the diagram, movements seem erratic and there are periods where developments go against the expected direction (i.e. “going backwards”). This of course does not yet say anything about the ability of this indicator set of reflecting labour market conditions. This is where the numbered quadrants and wage development come into play. As stated before, each quadrant represents a distinct state of the labour market. Below this is summarized again, together with the expected relative development in wages in each state.

*Table 2; Quadrant of the labour market gauge and corresponding labour market states.*

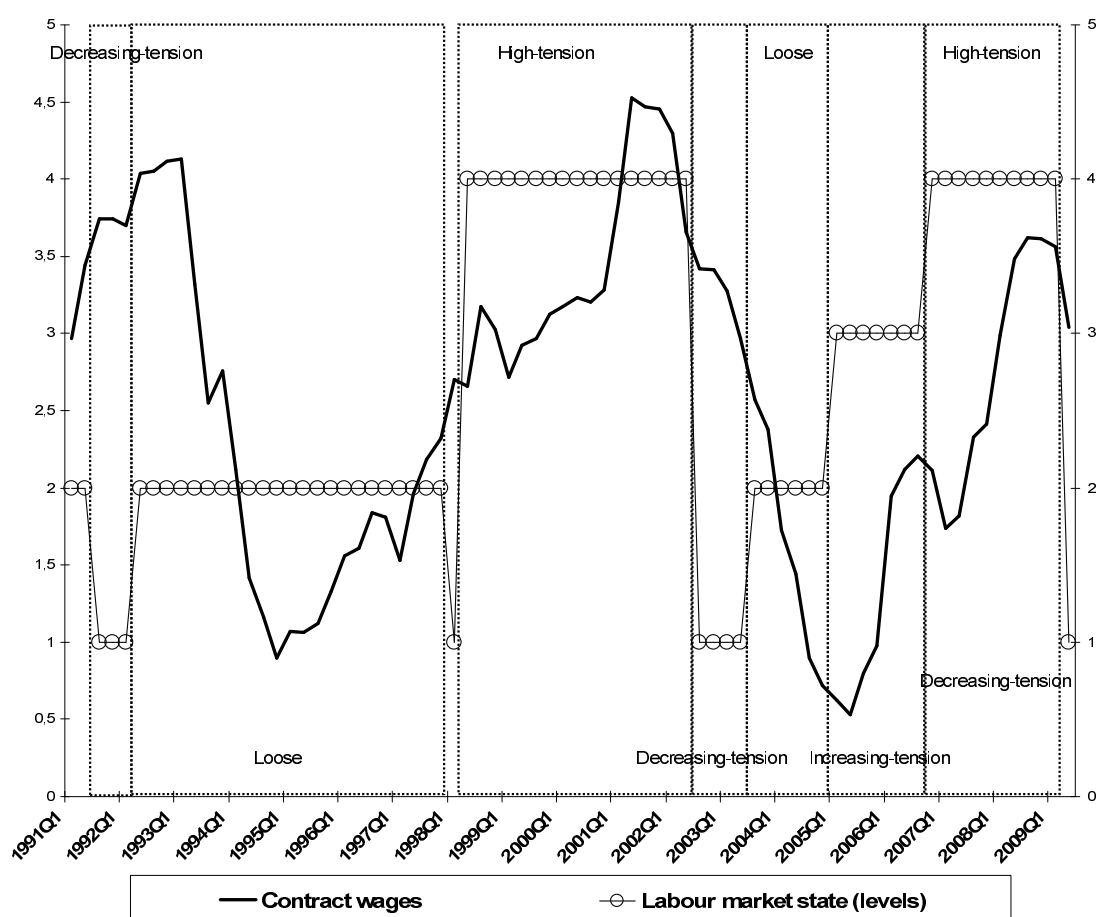
| <i>Quadrant</i> | <i>description</i> | <i>expected wage development</i> |
|-----------------|--------------------|----------------------------------|
| (2)             | Loose              | Low                              |
| (3)             | Increasing tension | picking up                       |
| (4)             | High tension       | High                             |
| (1)             | Decreasing tension | subsiding                        |

This classification gives a method for comparing the outcomes of the labour market gauge with the reference. At each point in time, here quarters, it will be determined in which quadrant, and thus in which state, the labour market tension gauge can be found. This chronology can then be compared with the chronology of the benchmark to test whether the outcomes are plausible and explain developments in the reference. It is not necessary for the chronology of the labour market tension gauge to match that of the reference exactly, but there should be broad agreement. The two chronologies are shown in graph 4.

If we analyze the chronology shown in this graph of labour market conditions according to the development of the level of vacancies and unemployment, quickly problems and inconsistencies become clear. There does not seem to be a clear relationship with wage development. For a start, in 1991 the labour market is classified as “decreasing tension” (1) whilst a big rise in wages is on its way. Even more, the labour market is classified as “loose” (2) from the beginning of 1992, long before the peak in wage growth in 1993. More seriously, according to this analysis, the labour market remains in the same state for almost six years, whilst in that period there are quite major changes in economic conditions and wage development. Subsequently, labour market conditions are said in 1998 to change immediately from “loose” (2) to “high tension” (4). Given economic conditions and wage growth, this is a credible classification, but a period in the intermediate stage of “increasing tension” would have been more credible. Then between 2002 and 2005 there follows

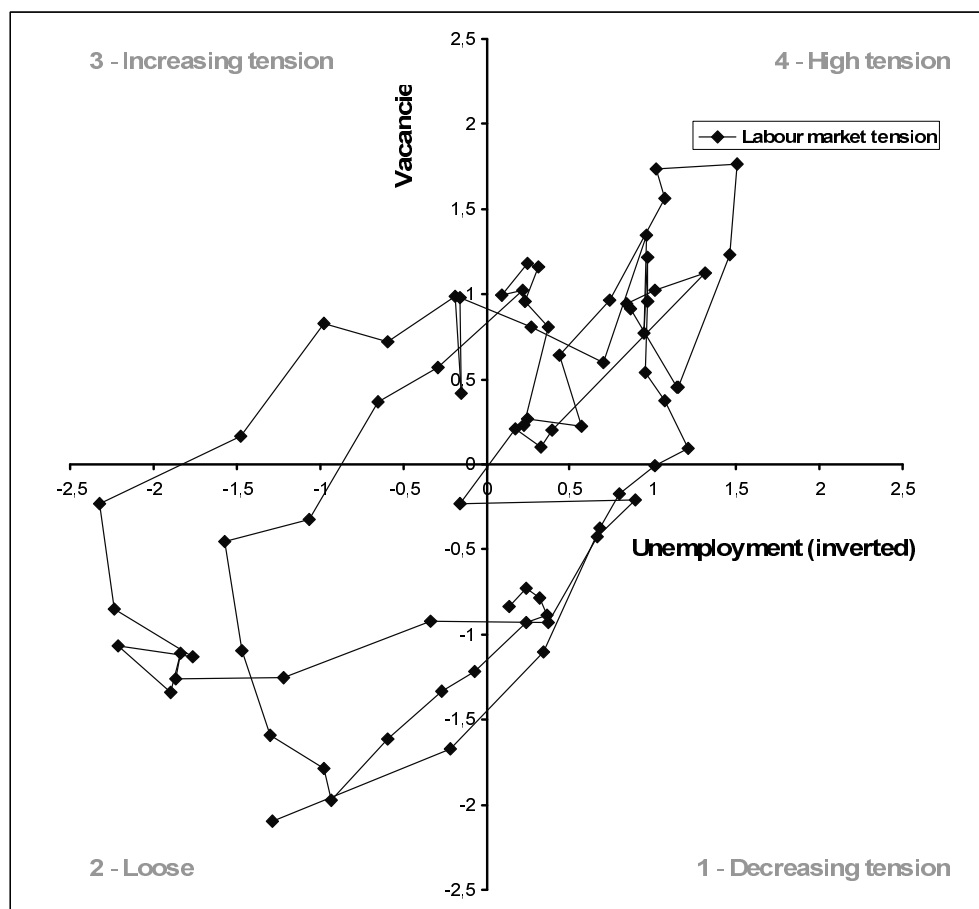
a period of erratic behaviour, whilst the peak in wage growth in 2001 is identified too late. It also seems that given wage developments, signalling a “high tension” (4) labour market in 2007 is somewhat premature.

*Graph 4; Wage development (growth rate of contract wages, left axis) compared to characterization of labour market tension according to labour market tension gauge based on unemployment and vacancies (in levels, states on right axis).*



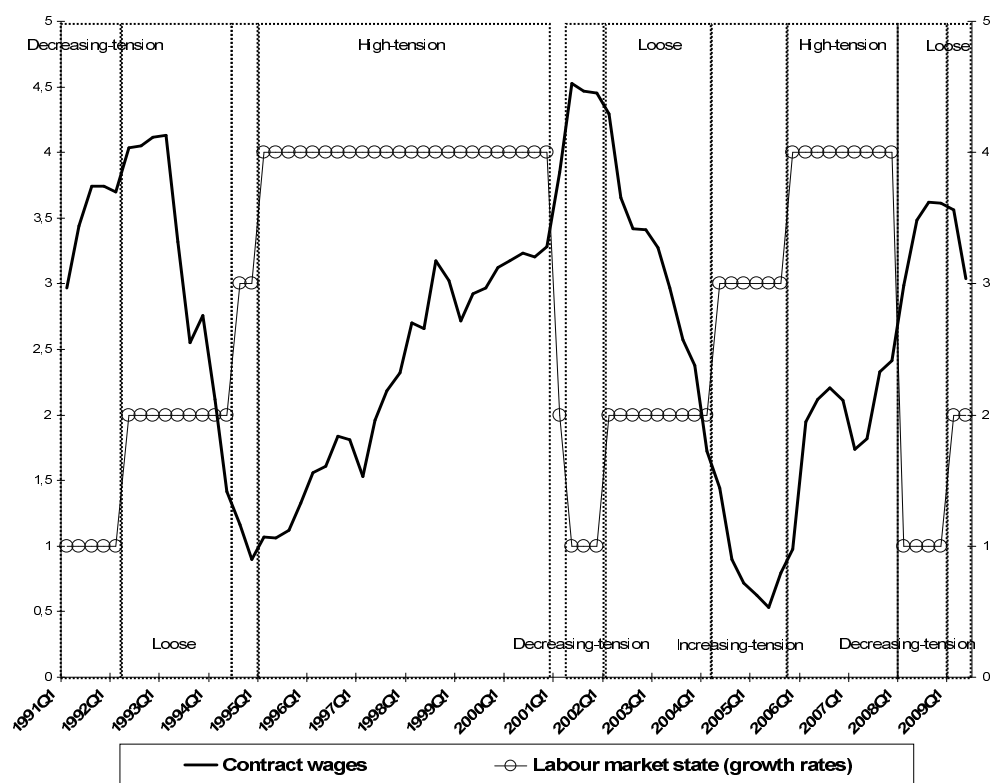
Overall, it can be said that using the levels of unemployment and vacancies to analyse the state of the labour market leads to inaccurate and somewhat confusing results. A labour market tension gauge based on growth rates in unemployment and vacancies looks more promising. The evolution in the diagram looks more cyclical, with somewhat less erratic behaviour.

Graph 5; Evolution of labour market tension according to labour market tension gauge based on vacancies (standardised growth rate, vertical axis) as labour demand indicator and unemployment (standardised growth rate, inverted, horizontal axis) as labour supply indicator, 1991-2009Q2.



The chronology for this indicator set also looks rather different, as might be expected given the transformation used. There is still the problem of the premature classification of the labour market as “loose” from 1991 onwards, but from 1994 the picture is very different. The minimum in wage growth in 1995 is correctly identified by a transition from a “loose” (2) labour market to a state of “increasing tension” (3). Only then a rapid transition to a “high tension” (4) labour market is indicated, a classification which lasts from 1995 to 2000. Even though wage growth is increasing in that period, it seems too strong a classification for the whole of that period. The peak in wage development in 2002 is, somewhat prematurely, defined by a transition to a state of “decreasing tension” (1). The subsequent transitions to “loose” (2), “increasing tension” (3) and “high tension” (4) seem to be running ahead of events, given the observed wage growth, even though there is a logical, but again somewhat early, signal for the minimum in 2005.

Graph 6; Wage development (growth rate of contract wages, left axis) compared to characterization of labour market tension according to labour market tension gauge based on unemployment and vacancies (in growth rates, states on right axis).



Overall, analysing the state of the labour market using the growth rates in unemployment and vacancies as indicators of respectively labour supply and demand leads to more credible results than performing the analysis using the levels of these indicators. There is a better match in chronology between wage development and the derived labour market tension, and logical developments explaining the occurrence of maxima and minima in wage development. But on the whole, the outcomes still seem to be somewhat crude, and regularly the timing seems to be off as well. So this constitutes an improvement, but still a too simplistic approach. It will be shown in the next sections that using a more sophisticated indicator of the supply of additional labour, and a more broadly based indicator of the demand for additional labour markedly improves performance. The observed evolution in time of labour market tension is much more smoothly and regular, and the match between economic conditions and observed labour market tension improves markedly as well.

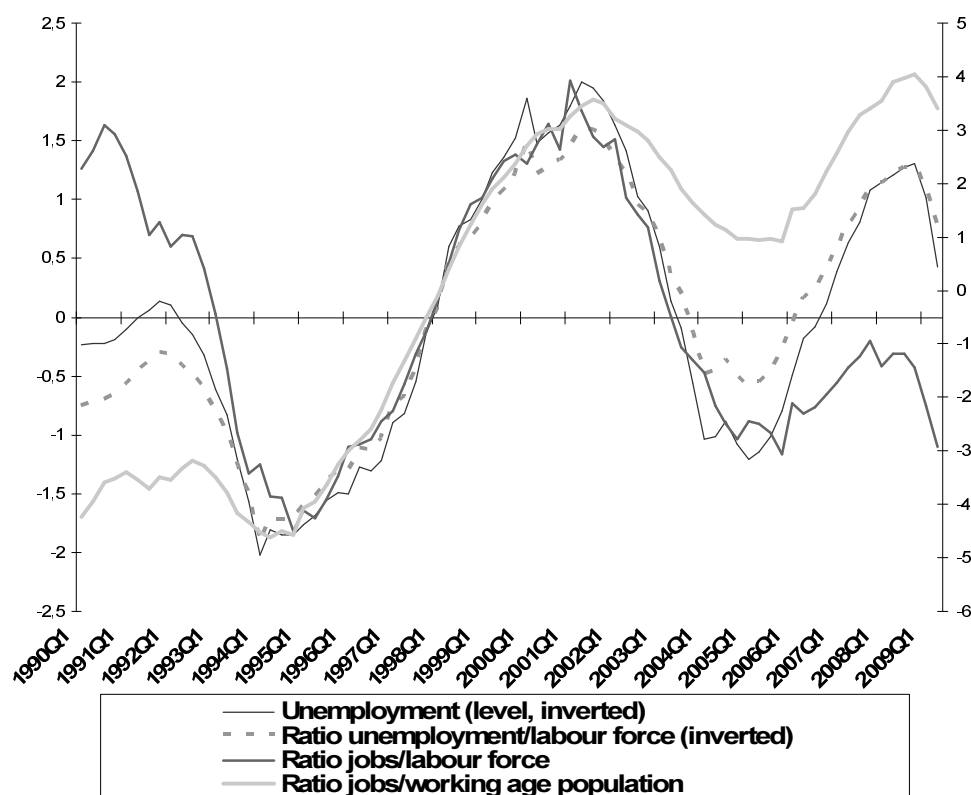
## **5. Proposed indicators of the supply of and demand for additional labour**

The results in the previous section show that the principle of analysing labour market developments in terms of supply and demand works, and that the labour market tension gauge is a useful tool. It also became clear that the precise indicators used are crucial, and that simply using unemployment and vacancies is too simplistic and yields inaccurate results. In this section, other indicators of the supply of and demand for additional labour will be developed and tested. In the next section, these will be combined in the labour market tension gauge and tested.

### **5.1 Supply indicators**

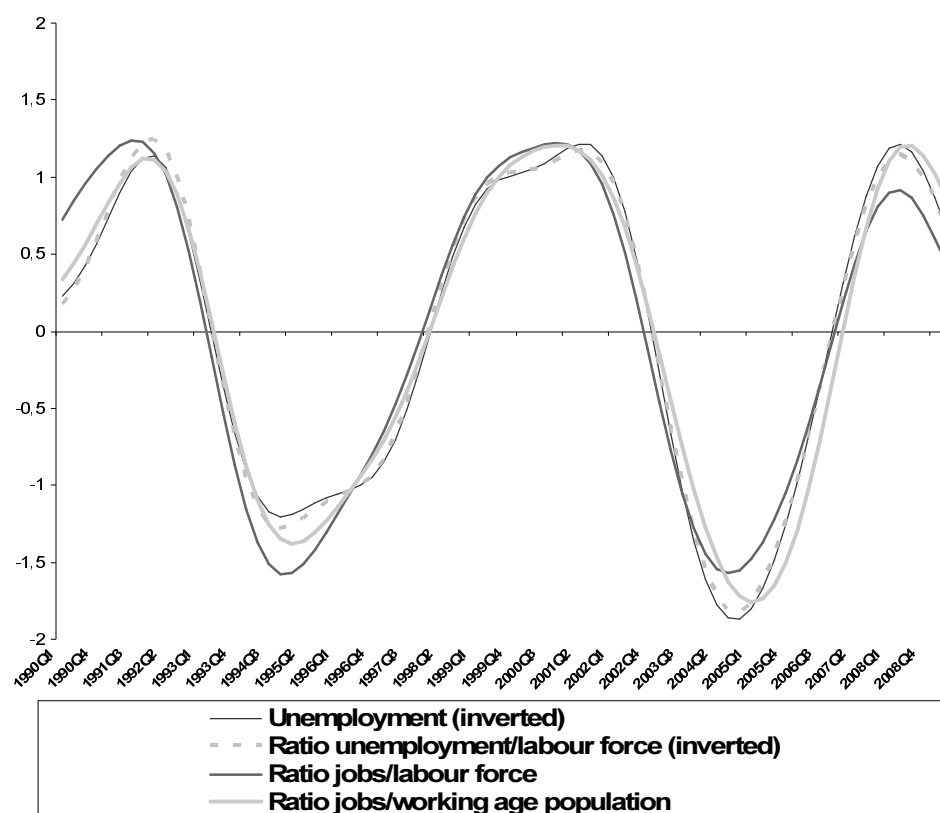
A basic requirement for the system is the availability of a good indicator for the available supply of additional labour. It should be noted here at the start that while the term “labour supply” will be used extensively, most indicators will be of “labour usage”, i.e. how many people are working. What is most relevant for the labour market is how much labour is freely available at any time. Or to formulate this the other way round, which part of the labour force is already employed? A high-tension labour market will among other things be characterized by a high percentage of employment. In a felicitous coincidence, high labour usage means low availability of additional labour, so these indicators can be used directly, while true labour supply indicators need to be inverted for use in the labour tightness gauge. On the other hand, a direct measure of the amount freely available labour is of course unemployment. In the previous section, the growth rate of unemployment gave relatively good results in the analysis, but this is a conceptually inferior indicator. A disadvantage here of unemployment per se is that it is in fact just a number, it would probably gain meaning by being compared to the total labour force. A relative growth rate would be even less informative here. In graph 7 development of the level of unemployment is compared to that of, and compared with three indicators of labour force utilization, unemployment as fraction of the labour force, and the number of jobs compared to both the total labour force and to the total working age population (15-65 years).

Graph 7; Several potential labour supply indicators. Unemployment (level unemployed labour force, seasonally adjusted, inverted and standardised), ratio of number of jobs to total labour force (seasonally adjusted, standardised), ratio of number jobs to total working age population (seasonally adjusted, standardised) and ratio of unemployment to total labour force (seasonally adjusted, inverted and standardised)..



Two things are important here; the fact that these different measures of labour utilization exhibit a remarkably similar development, and the presence of a, stronger or weaker, trend in all indicators. This last fact is initially the most important. The presence of a trend can be attributed to structural changes in the economy, labour market and the participation rate. As the aim here is to analyse developments linked to the business cycle, and not structural changes, the trend should be removed from these series. This should result in a more relevant and clear reflection of labour supply conditions. Removing trends like this to focus on medium term developments is standard practice in business cycle analysis and well developed filtering tools are available. Here, the Christiano-Fitzgerald filter has been used to isolate developments with periods between three and 12 years. The results are shown in graph 8.

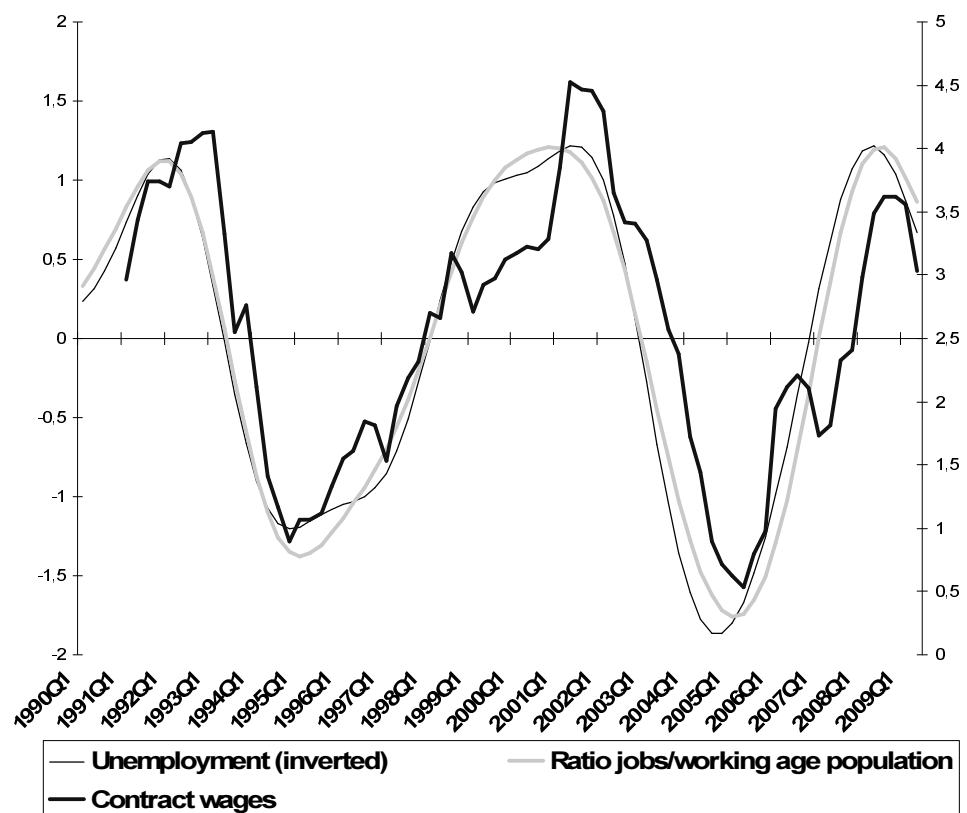
*Graph 8; Filtered cycles of potential indicators of available supply of additional labour. Unemployment (level unemployed labour force, inverted), ratio of jobs to total labour force, ratio of jobs to total working age population, and ratio of unemployment to total labour force (inverted). Cycles extracted by full-sample symmetric Christiano-Fitzgerald filter, periods 3Y-12Y.*



This correction yields very satisfactory results. Not only is the evolution of the different series much smoother, but in all of them there is a clear alternation visible between periods of below and above average labour usage, or tightness of labour supply. What is remarkable is the degree of concordance between the different indicators. There is some difference in the timing of the peaks and troughs, and on when periods of above and below average development begin, but not much. The cyclical development of unemployment and the ratio of unemployment to the labour force is virtually identical. So even though the ratio of unemployment to the labour force is a conceptually better indicator of labour supply tightness, for simplicity's sake the cyclical development of unemployment will be taken to the next stage of development as potential indicator for the available supply of additional labour. Also considered will be the cyclical development of the ratio of jobs to the working age population. This is conceptually the best indicator of what proportion of potential labour supply is currently employed, and therefore not capable of supplying additional labour. The number of jobs is in full time equivalents, i.e. part-time jobs have been converted pro rata into the equivalent number of full-time jobs. In the next stage, it will be tested which of the two indicators of the available supply of additional labour is to be preferred. It is important to note that for the use intended

here, it is not necessary that the labour supply indicator exactly defines the percentage of the labour force employed, just as long as it is a good proxy for this. The emphasis is on the extent of the deviation from average, i.e. is the supply of additional labour (usage) developing below or above average. Just as long as the labour supply indicator deviates from average in roughly to the same extent as the “true” employed fraction of the labour force, it will give the needed information. Finally, it is interesting here to analyse how the development of the supply of additional labour compares to that of the benchmark for tension in the labour market, wage growth.

*Graph 9: Wage development (growth rate of contract wages) compared to filtered cycles of potential indicators of additional labour supply. Unemployment (level unemployed labour force, inverted), ratio of jobs to total working age population (15-65y), both after application of Christiano-Fitzgerald frequency filter. Shaded areas: periods of relatively tight labour supply or high wage growth.*



What can be seen is that periods of tight supply of additional labour (above average ) tend to coincide with periods of relatively high wage growth. This is a very satisfactory result. On the other hand, the connection between the important turning points in wage growth and the peaks and troughs in labour supply is much looser. In three of the four cases labour supply turning points lead those of wage development, and even then with seriously varying leads. This suggests that at those times other factors are at work as well, probably in the demand for additional labour. These

results indicate that the most relevant aspect of labour supply tightness is whether it is above or below average. This will signal the beginning and ending of periods of relatively high wage growth, a logical result. Also, in the labour market tension gauge diagram, going from below to above average development or vice versa, means moving from one quadrant, or labour market state, to the other. Therefore it is this crossing of the horizontal axis which has signal value, and not the turning points in labour supply.

## **5.2 Demand indicators**

The next step is finding an indicator or set of indicators representing the demand for additional labour. More precisely, the aim is to find indicators for the *strength* of the demand for additional labour. It will suffice to have an indicator which shows whether demand for additional labour is relatively strong or weak, and whether it is increasing or decreasing. The most direct indicator for the demand for additional labour is of course vacancies. But as shown earlier, vacancies alone are an imperfect indicator of the total intensity of labour demand. There are several possible explanations; the official vacancy statistics probably do not measure job openings filled informally, vacancies deemed too difficult to fill, demand for additional labour filled by overtime or efficiency measures, or existing new labour demand not yet formalised into vacancies. Especially the last two categories are interesting, because whilst impossible to measure, all these types of demand for additional labour are linked to economic activity, and should thus be related to other economic indicators. For a start there are the staffing expectations from the different business surveys, which are probably more comprehensive indicators for the strength of demand for new labour than reported vacancies. But other indicators will contain useful information, such as business survey indicators concerning orders, or real indicators such as GDP growth, and more conventional the demand for temporary labour.

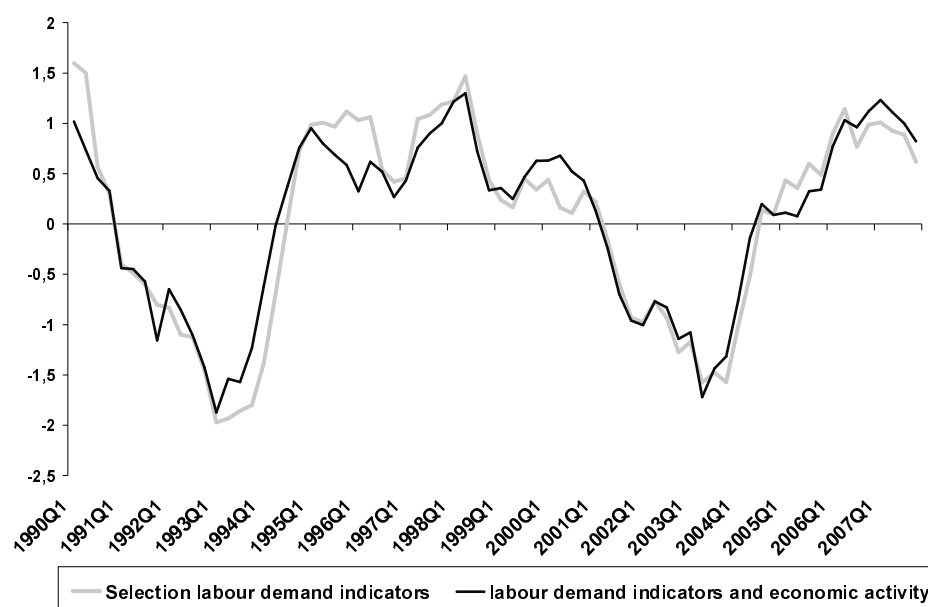
Therefore it will be tested here whether broadly-based sets of indicators of the demand for additional labour credibly reflect the intensity of the need for additional labour. A set based purely on labour-related indicators will be presented, as well as one containing also more general indicators of economic activity. All component statistics are standardised, after which a simple average is taken to arrive at the overall indicator. Again, this works because the aim is not arrive at some exact quantification of labour demand, but a measure for its relative intensity. If all component indicators have realisations above average, then their average will in turn reflect this strong agreement. And using a sufficiently broad indicator set guarantees that a deviating realisation of one component indicator will not distort the overall outcome. Below the composition of the two possible indicator sets is given.

Table 3; Two potential indicator sets representing demand for additional labour.

| <i>Labour demand indicators</i>                              | <i>labour demand and economic activity</i>                   |
|--------------------------------------------------------------|--------------------------------------------------------------|
| <b>Vacancies (growth rate)</b>                               | <b>Vacancies (growth rate)</b>                               |
| <b>Temporary employment (growth rate)</b>                    | <b>Temporary employment (growth rate)</b>                    |
| <b>Business services survey; staffing level expectations</b> | <b>Business services survey; staffing level expectations</b> |
| <b>Temp agencies survey; staffing level expectations</b>     | <b>Temp agencies survey; staffing level expectations</b>     |
| <b>Manufacturing survey; staffing level expectations</b>     | <b>Manufacturing survey; staffing level expectations</b>     |
|                                                              | <b>GDP (growth rate)</b>                                     |
|                                                              | <b>Business services survey; Assessment new orders</b>       |
|                                                              | <b>Manufacturing survey; Assessment new foreign orders</b>   |
|                                                              | <b>Manufacturing production (growth rate)</b>                |
|                                                              | <b>Bankruptcies (growth rate, inverted)</b>                  |

Surprisingly enough there is little difference in evolution between these two indicator sets, see graph 10.

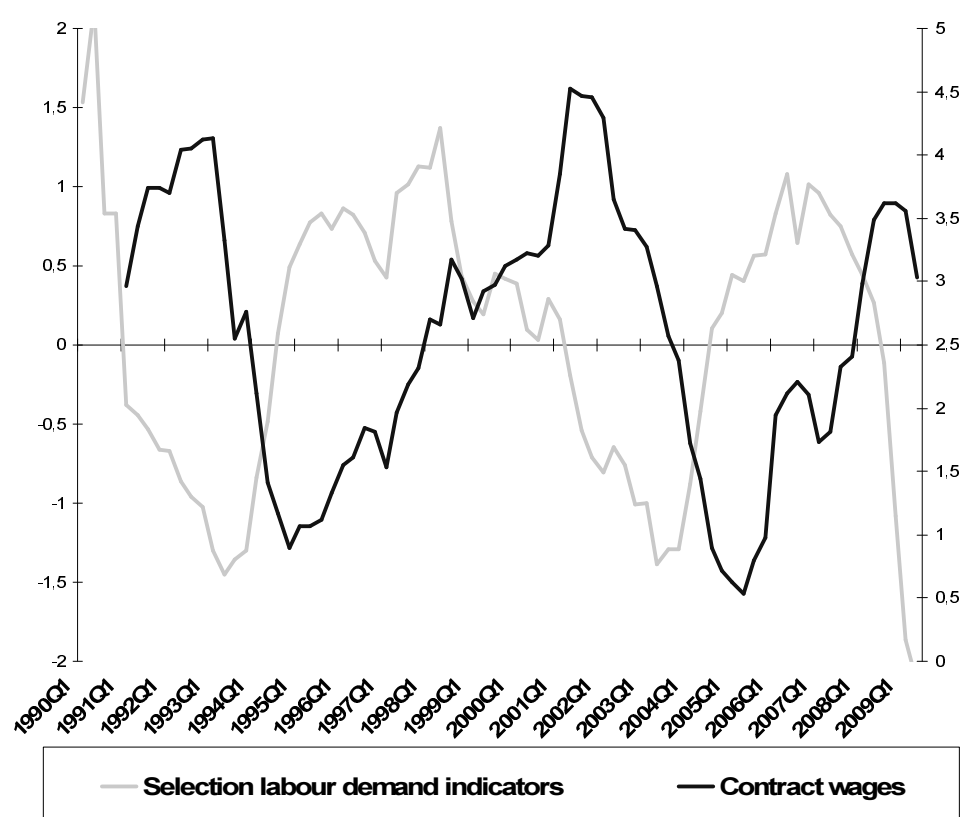
Graph 10; Potential composite indicators of demand for additional labour. Two potential indicator sets, both standardised averages.



Especially relevant is the fact that there is hardly any difference between the moments at which the indicator sets cross the horizontal axis, i.e. the moments when demand goes from below average to above average and vice versa. As explained

before, these are the crucial moments as this means a change of quadrant in the labour market tension gauge, and therefore a signal that the state of the labour market has changed. As there is little difference between the two sets, it is preferable to continue with the set which consists just of actual labour demand indicators. This is conceptually easier to understand and communicate, whilst at the same time being more parsimonious. The next stage is to compare the labour demand indicator to wage development, see the next graph.

*Graph 11; Wage development (growth rate of contract wages) compared to development of demand for additional labour according to composite indicator (average of various standardised labour demand indicators). Shaded areas indicate moments of transition between relatively high and low labour demand, and corresponding turning points in wage development.*



An interesting, and highly relevant, pattern becomes visible. It seems to be the case that turning points in wage development are linked to changes in the development of labour demand. More precisely, a peak in wage growth is preceded by a change from above average intensity of demand for additional labour to below average, whilst a minimum in wage growth is preceded by a transition to above average intensity in demand for new labour. Theoretically this makes sense, and also quite important this means that turning points in wage growth will be signalled by a change in quadrant in the labour market tension gauge. It also means that the labour demand data will be a useful addition to the labour supply indicators, as these had

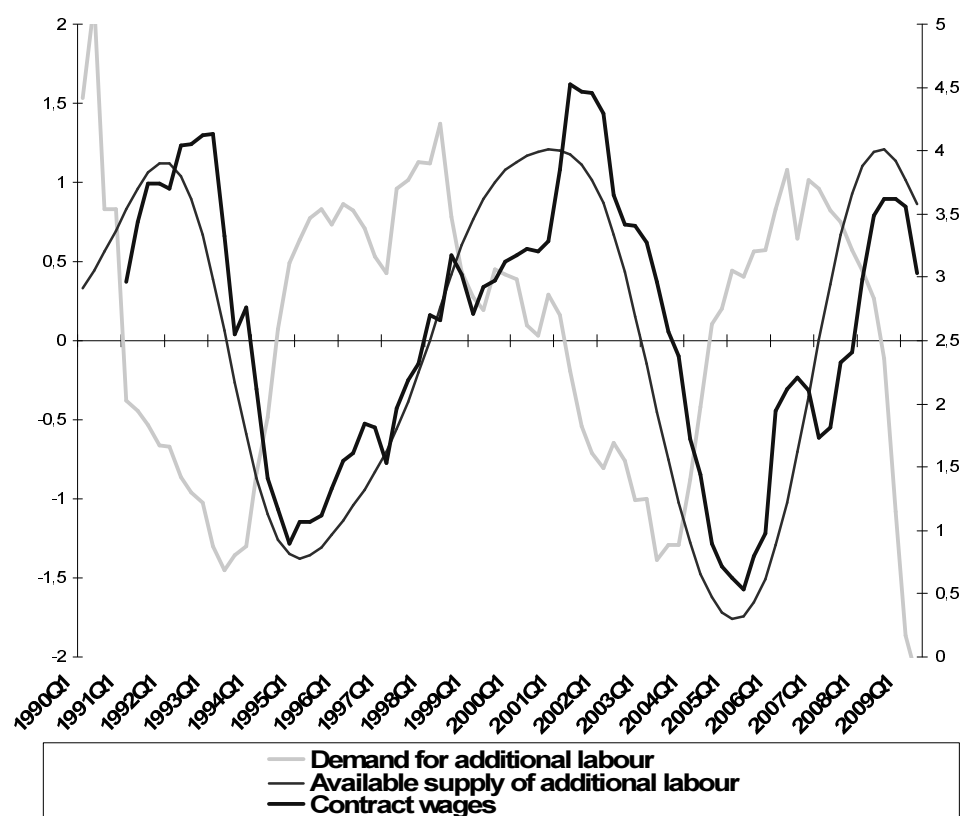
difficulty in identifying turning points in wage development, which represent turning points in labour market conditions. This supports the validity of the labour market tension gauge concept and of defining four distinct labour market states as represented by the quadrants of the labour market tension diagram. The next stage is then to combine the computed indicators of the supply of and demand for additional labour to arrive at the full labour market tension gauge.

## **6. Confronting supply and demand; the complete system**

At this point, the optimised components can be brought together, yielding the full system. First, it will be shown how this allows for a more comprehensive analysis of labour market developments than the partial analyses of the previous section. By charting the development of wages next to respectively the evolution of demand for and supply of additional labour, it became clear in that section that whenever these changed from below average development to above average, or vice versa, a distinctive change happened in the labour market. Below average available supply of additional labour (high employment) was shown to coincide with periods of relatively high wage growth. A transition from above to below average demand for additional labour signalled the occurrence of a peak in wage growth, whilst the reverse development signalled a minimum in wage growth. But none of these partial analyses was able to fully explain wage development, and thus fully describe the state of the labour market. By combining indicators for supply and demand for additional labour, this becomes possible. In graph 12 the indicator for the supply of additional labour based on the ratio of jobs to the working age population and the composite indicator for the demand for additional labour based on selected labour demand indicators are shown, in combination with wage growth.

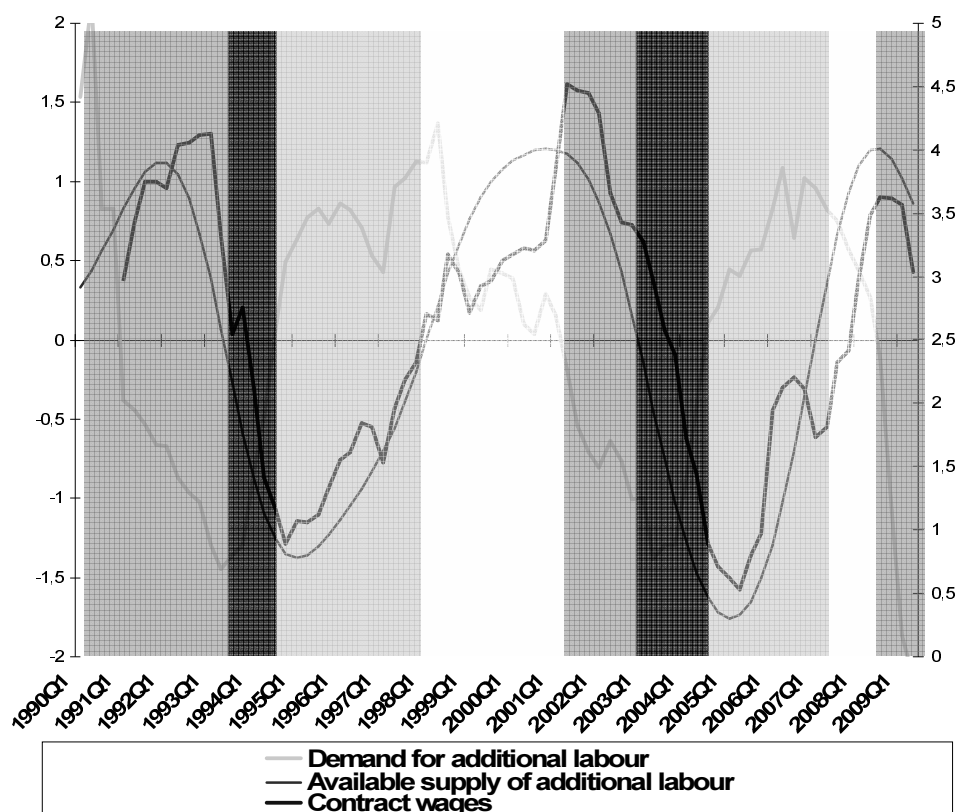
With some effort, it can be seen that when combined, labour demand and labour supply developments can account for a large part the important developments in the labour market as represented by the evolution of wage growth. Whenever one of the indicators crosses the horizontal axis, and thus switches between above and below average development, the labour market goes into a different state. For example, if both labour demand and supply develop below average, the labour market will be loose, as reflected in corresponding periods of low and decreasing wage growth. If demand for additional labour then starts picking up again, caused by increasing economic activity, it can be seen that a minimum in the growth rate of wages tends to occur shortly after demand crosses into above average development.

Graph 12; Composite indicator of demand for additional labour and supply indicator based on ratio of jobs/labour force, compared to growth rate of contract wages.



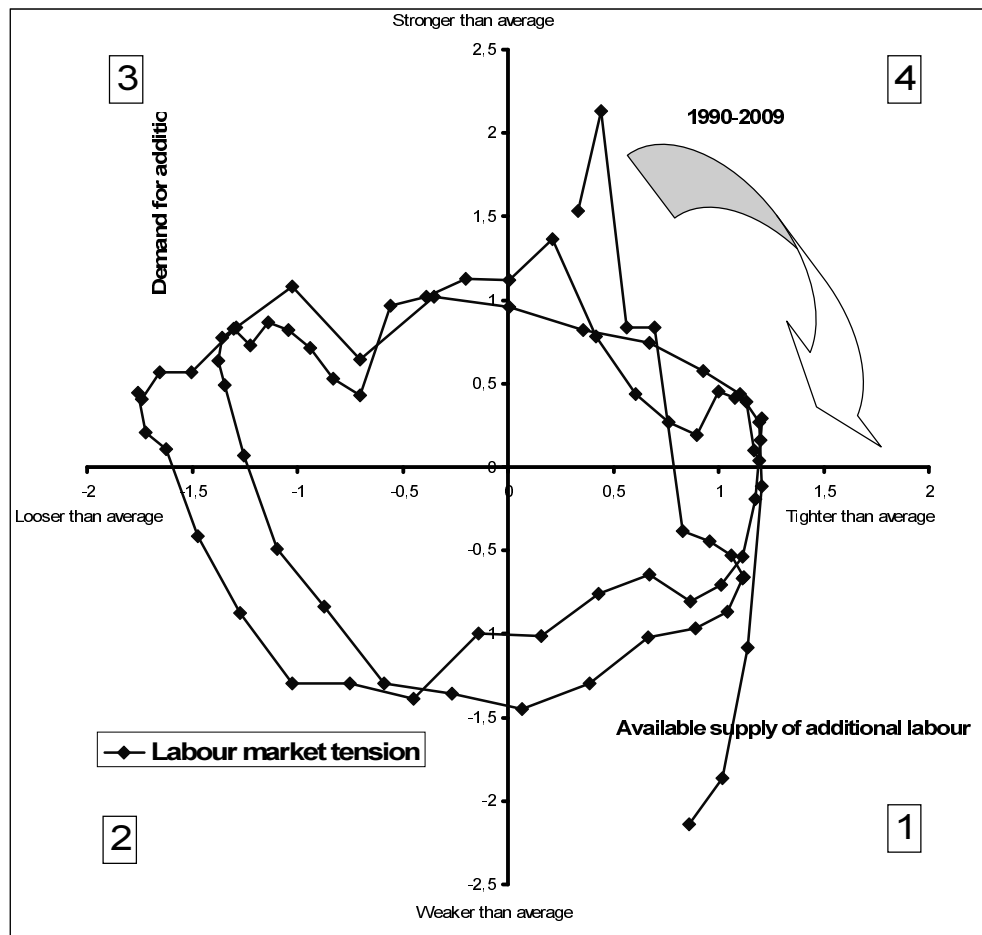
In the next, possibly slightly confusing, graph, it is indicated how the state of the labour market evolves according to the indicators for the supply of and demand for additional labour. Each time one of the two crosses the horizontal axis, a new state is signalled, which can be interpreted according to the labour market tension schedule developed in section 2.

Graph 13; Composite indicator of demand for additional labour based on composite labour demand indicator and indicator of the available supply of **additional** labour based on ratio of jobs/working age population, compared to growth rate of contract wages. Shading represents different labour market states according to supply and demand indicators. Orange edge = both supply and demand below average, red = demand below average, supply above, fat yellow edge = both supply and demand above average, light green = demand above average, supply below. Supply below average means labour usage above average (= tight supply).



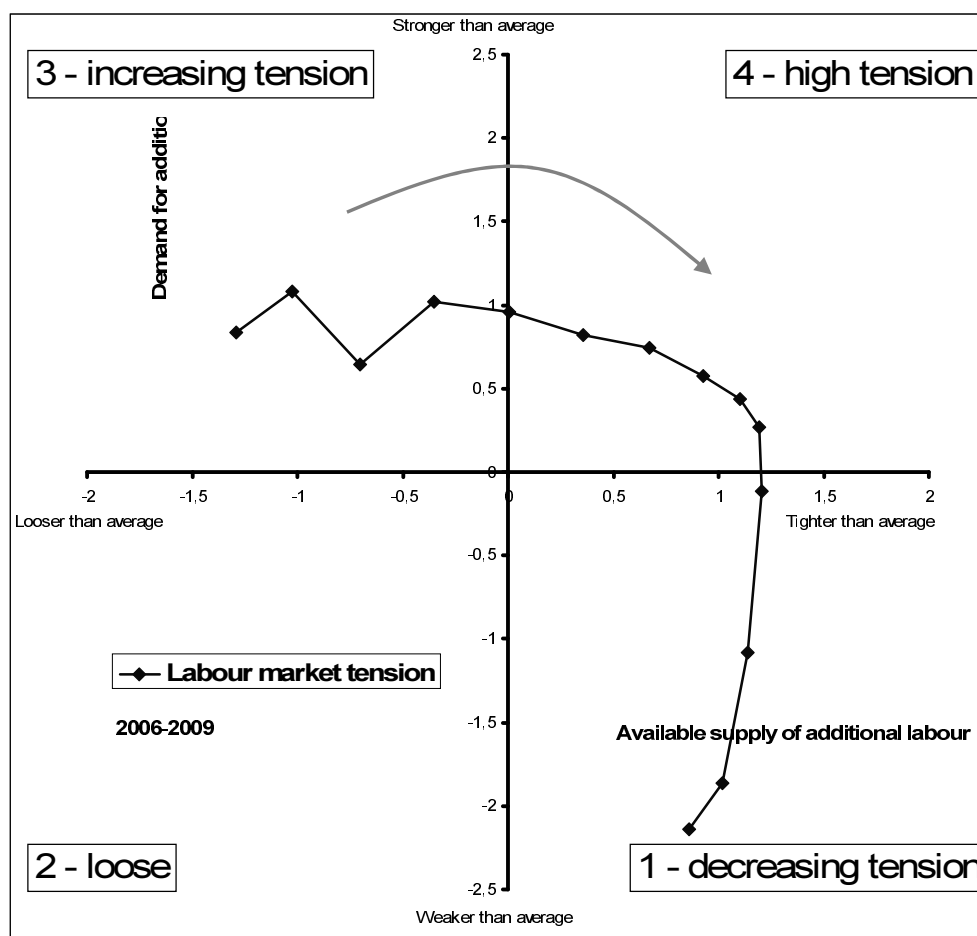
How this works can more clearly be seen in the labour market tension gauge diagram, where the development of the available supply of additional labour (horizontal axis) is charted against the development of the demand for additional labour (vertical axis). As described in section 3, each quarter of the diagram represents a specific state of the labour market, which corresponds in turn to the different phases visible in graph 13 above. When plotting labour demand and supply in this diagram over the period 1991-2009, a very regular circular motion becomes visible.

Graph 14; The labour market tension gauge with the development of labour market tension between 1991 and 2009 according to labour supply based on the ratio jobs/working age population and composite labour demand.



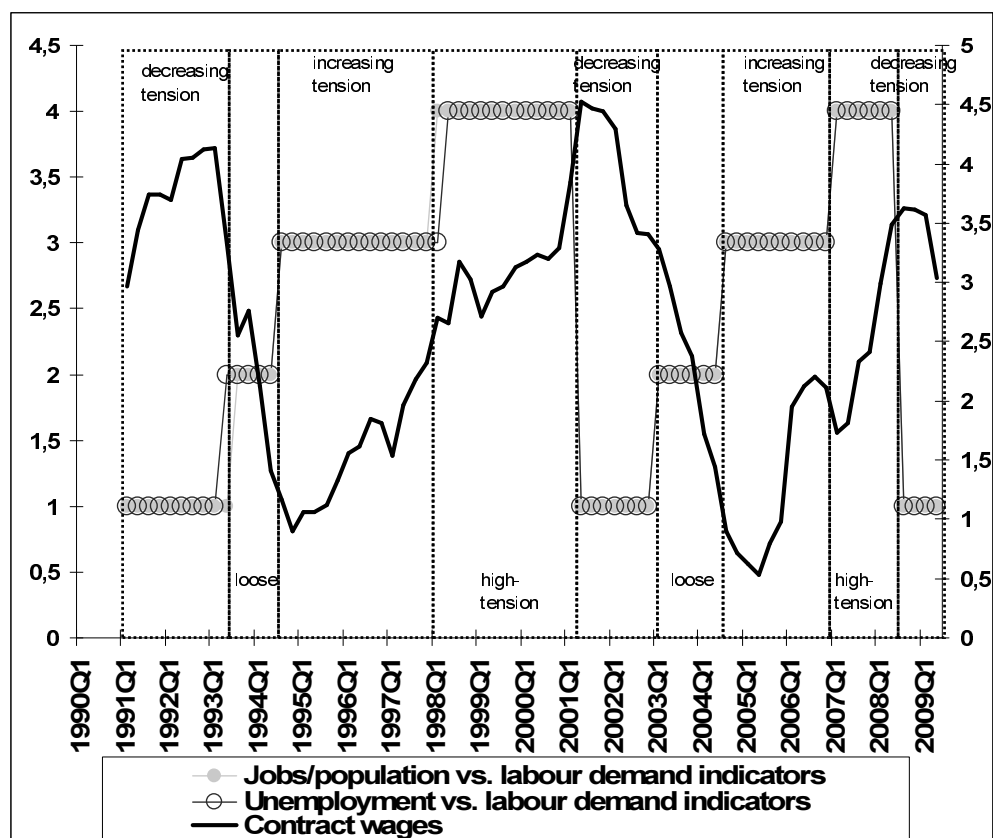
The diagram indicates that in the period considered, the labour market underwent two complete cycles of increasing and decreasing tension, which can be connected to the occurrence of almost two complete business cycles in the same period. The regularity and smoothness of this evolution of the labour market is quite remarkable, given the fact that as mentioned earlier there is no a priori requirement that the labour market develops according to a regular cycle. The labour market tension gauge would function just as good if the labour market developed much more erratically. But it is testimony to the usefulness of the concept that this development is made visible so clearly by combining labour supply and demand indicators. Tracking developments in a more limited time span will probably support this case, as it will be easier to interpret. In graph 15 development in the years 2005-2009 is isolated, which shows a continuing increasing of labour market tension from a state where supply is still loose, to a high tension labour market in the beginning of 2007, where both demand for additional labour is strong and supply is tight.

Graph 15; The labour market gauge with the development of labour market tension between 2005 and 2009 according to labour supply based on the ratio jobs/working age population and composite labour demand.



The credibility of this pattern can be confirmed by considering the development of wage growth, which also exhibits a smooth, cyclical pattern. This analysis also confirms that the modified indicators of labour supply and demand developed in the previous section perform much better than simply relying on unemployment and vacancies. As shown in section 3, these exhibited a much more irregular development, which also connected imperfectly with observed wage growth. Further confirmation can be found by analyzing the outcomes of the labour market tension gauge. This is done as before by charting the derived labour market states against the development of wage growth. In graph 16 labour market states resulting from two variants of the labour market tension gauge are shown together with wage growth. One variant is based on the ratio of jobs/working age population as indicator for the available supply of additional labour, the other on unemployment. Both variants use the same composite indicator of the demand for additional labour. The outcomes using two different labour supply indicators are compared to test whether these yield different outcomes and to determine which one performs best.

Graph 16; Wage development (growth rate of contract wages, left axis) compared to characterization of labour market tension according to both labour market gauge using unemployment and labour demand indicators and ratio of jobs/working age population and composite labour demand indicator.



Overall, using the indicators of supply and demand for additional labour developed here, in combination with the labour market tension gauge concept, means that a robust, credible and informative characterization of the labour market can be performed. All major developments in the labour market can be explained by developments in supply and demand for additional labour at the time, showing how this concept adds information. It should be noted here again that the aim of the labour market tension gauge *is not* to predict or explain wage development. Wage growth functions here as an indicator of labour market tension, and is purely used as benchmark to test whether the outcomes of the labour market tension gauge make economic sense.

Recall that state 1 is a loosening labour market, state 2 a loose labour market, state 3 increasing tension, and state 4 a tense labour market. The labour market indicators used here show that a peak in wage growth (the end of a tense labour market) is accompanied by a transition from state 4 to 1, a loosening labour market where supply is still tight, but demand for additional labour has started to fall off. Matching this is the observation that the end of a decline in wage growth can be reliably signalled by a transition from state 2 to 3, a labour market with increasing tension which indicates that demand for additional labour has strengthened significantly,

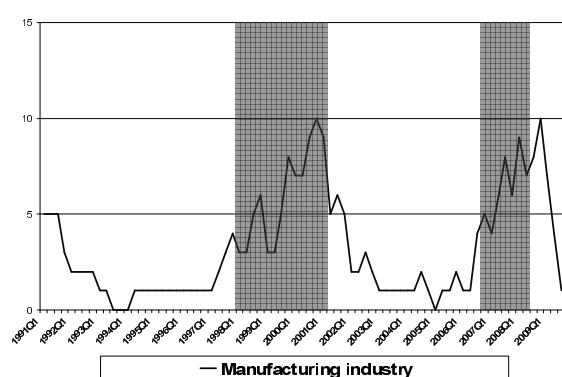
even though supply is still loose. Also, high wage growth is signalled by labour market state 4, a tense labour market where supply of additional labour has become tight (wage growth increased in 2008), whilst demand remains strong. A period of relatively low wage growth seems to start when the labour market enters state 2, a loose labour market where additional labour is readily available while demand remains weak. The observed evolution of labour market states makes economic sense, and can be directly connected to business cycle developments in the Netherlands. This analysis also offers a solution to one business cycle puzzle; why do wages keep rising after the business cycle has peaked? This happened for example after the business cycle peak in 2000, when the highest wage rises were registered in 2001, and the same happened after the business cycle peak in 1990. The labour market tension gauge framework offers an immediate solution; in those circumstances labour supply remained tight for some time after the business cycle peak, even though economic activity was diminishing, as reflected in declining labour demand, resulting in continuing relatively high wage rises.

As far as the performance of the two different variants of the indicator of the available supply of additional labour is concerned, the diagram shows that there is little difference between the two. Over the whole period considered they give different signals in only two quarters. The system using the ratio of jobs/working age population as labour supply indicator is to be preferred somewhat, as its signals fit slightly better. But is also the theoretically more relevant concept, as it indicates which part of the labour force is already employed, and which is still available.

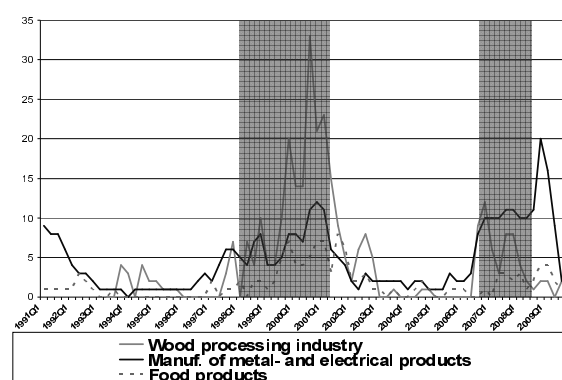
From the previous it might seem that the labour market tension gauge is a tool for analysing and predicting wage growth. This is certainly not the case, it is not a model explaining wage growth, and the gauge is computed and functions completely independent from that statistic. Wage growth is used purely as a benchmark for testing the credibility of the outcomes of the tension gauge, as it is a good proxy of labour market tension. To show the independence of the labour market tension gauge from wage growth data, and as a further confirmation of the validity of the outcomes, these will be compared to other, independent statistics. The business surveys conducted by Statistics Netherlands in the manufacturing industry and the commercial services contain a set of questions which can serve as a second independent benchmark. Companies are asked to indicate whether there are impediments to production, and if so choose the cause from a list of options. Two of these options are very relevant for testing the labour market characterizations of the labour market tension gauge; firstly production impediments caused by shortage of labour, and secondly production impediments caused by insufficient demand. From the survey, the percentage of firms suffering from a specific production impediment is calculated. In a situation of high-tension in the labour market, a high percentage of firms will report that production is hindered by shortage of labour. On the other hand, when a high percentage of firms reports insufficient demand for its products, this will probably correspond with a period of adverse economic conditions, which are generally associated with a (relatively) loose labour market. Therefore, in periods when the labour market tension gauge indicates these labour market states, a

high percentage of firms should report the matching production impediments. This is actually the case. In graphs 17a and 18a, it is shown that in periods of high-tension in the labour market, a sharp increase is found in the number of firms reporting staffing shortages. Conversely, graphs 19a and 19b show that when the labour market is loose, an increased percentage of firms, both in the manufacturing industry and in commercial services, reports to be suffering from insufficient demand.

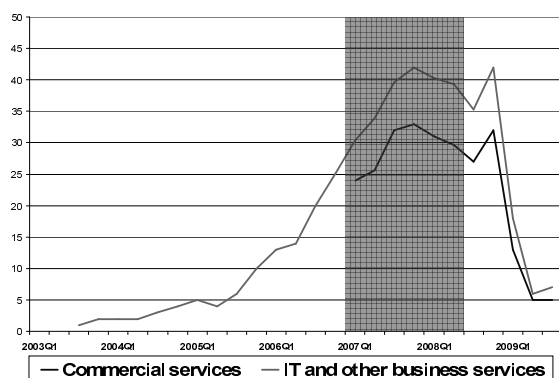
*Graph 17a; production impediments staffing shortage; manufacturing industry. Red shaded area = period of high-tension labour market*



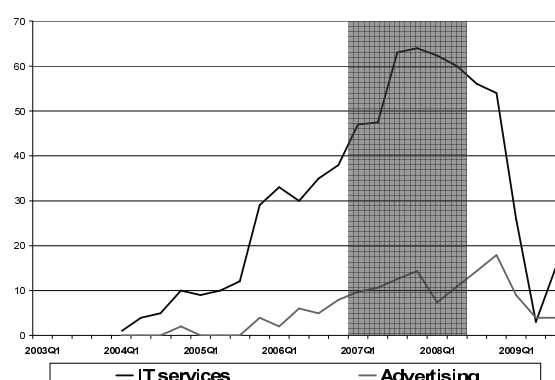
*Graph 17b; production impediments staffing shortage; Wood processing, manufacturing of metal- and electrical products, and food processing. Red shaded area = period of high-tension labour market*



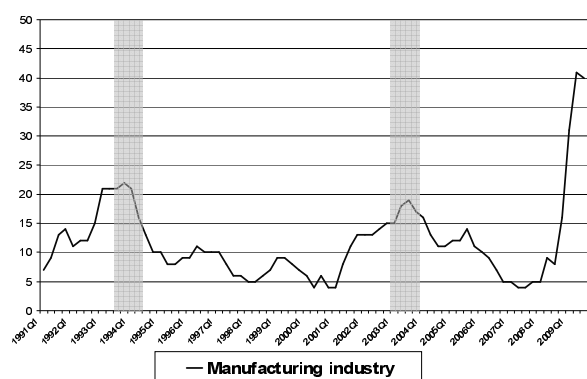
*Graph 18a; production impediments staffing shortage; Commercial services and IT- and other business services. Red shaded area = period of high-tension labour market*



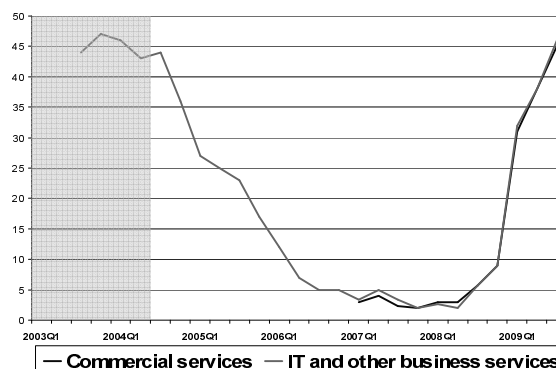
*Graph 18b; production impediments staffing shortage; IT-services and Advertising. Red shaded area = period, of high – tension labour market.*



*Graph 19a; production impediments insufficient demand; manufacturing industry. Green shaded area = period of loose labour market*



*Graph 19b; production impediments insufficient demand; Commercial, services and IT- and other business services. Green shaded area = period of loose labour market*



These results again confirm the credibility of the labour market characterisations produced by the labour market tension gauge. But there is more. These business survey data offer a possibility to deepen the information offered by the labour market tension gauge and enhance its usefulness. The labour market tension gauge only gives a macro characterisation of the labour market. Business survey indicators however are available several levels of aggregation. It is therefore not only possible to see whether services are suffering more from shortages of labour than manufacturing, as in graphs 17a and 18a, but also which branches of manufacturing and services are experiencing the worst problems. For example, graph 17b shows that the wood processing industry and manufacturing of metal and electrical products repeatedly experience problems in a high-tension labour market, whilst the food processing industry seems to have less staffing problems. A similar difference arises when comparing the problems of IT-services and the advertising industry in a period of high-tension in the labour market, see graph 19b.

## 7. Conclusions

Given its importance to the economy and people's lives, a correct analysis of the situation on the labour market is crucial. Here, a tool is presented which allows for a robust characterization of the state of the labour market and also for a meaningful analysis of the underlying developments. The focus is on medium-term developments, i.e. from a business cycle point of view. This means that structural changes and long-term trends have been intentionally abstracted from. Separating the analysis of labour market developments in medium-term and long-term analysis allows for a more precise characterization of the current situation at any point in time.

The approach presented in this paper is based on the insight that analysing labour market developments should be done by the combined analysis of developments in supply of and demand for additional labour. The labour market is, of course, a market, but short-term analysis tends to focus on developments in individual indicators, say unemployment or the number of new jobs. By creating a coherent indicator set which represents labour market developments more comprehensively, this research has shown how analyzing statistical indicators in a coherent manner can yield information which individual indicators do not possess.

The focus of the tool developed here is on identifying and tracking labour market tension as a way for characterizing the state of the labour market. Hence its name, the labour market tension gauge. It is shown here that labour market tension is an informative approach to characterizing labour market developments, and that it requires simultaneous tracking of the development of supply and demand for additional labour. Relying on single indicators will not do, as this for example cannot explain why wage growth remains high whilst economic activity is declining, or why the labour market remains loose whilst the level of vacancies is increasing. By confronting the development of labour demand with that of labour supply, new statistical information is created, which is shown to reflect labour market tension.

The tool developed here, the labour market tension gauge, plots the development in demand for additional labour against that of the available supply of additional labour. Thus the development of tension in the labour market becomes visible. Both the indicators of supply and demand for additional labour are entered as deviations from average development, meaning that a negative realisation in the gauge reflects below average development. This focus on deviations from average development means that it is not necessary to exactly quantify labour demand and supply, just whether these are stronger or weaker than average. This is justified by the fact that the aim just is to arrive at a general and robust characterization of the state of the labour market, not an absolute quantification of labour market tension. It is also a

relevant approach for identifying business cycle related developments. The set-up defines four different possible states for the labour market, which correspond to a quadrant of the labour market tension gauge diagram. For example, the state “loosening labour market” is defined by below average strength of demand for additional labour and below average availability of additional labour, and corresponds to the lower right quadrant of the gauge diagram. This is the intermediate state between a tense and a loose labour market.

The resulting characterizations of the state of the labour market were robust and credible. It transpired that changes from one labour market state to the other occurred rather smoothly and logically, in an order matching the corresponding business cycle developments. The set-up combining different types of indicators allowed for an insightful analysis of the observed labour market developments. These results were confirmed by using the growth of contract wages as a benchmark indicator for labour market tension. Turning points and different phases in wage growth could be explained by the observed developments in labour supply and demand, and were usually timely signalled.

To achieve an optimal result, it was necessary to select appropriate indicators of the available supply of additional labour and of the demand for additional labour. A simple approach just based on unemployment as labour supply indicator and vacancies as labour demand indicator was shown to yield somewhat volatile and incorrect results. The indicators of the available supply of additional labour needed to be corrected for trend components, and in the end preference was given to the ratio of jobs to the working age population. This is a good indicator for the fraction of the labour force already employed, and therefore not available as additional labour. For the demand for additional labour, a composite indicator was developed containing the development of vacancies next to a number of additional indicators of labour demand, such as temporary employment and business survey indicators. It is logical that this composite indicator exhibits superior performance, as not nearly all need for additional labour materialises as a recorded vacancy.

All in all, the labour market tension gauge is a useful additional tool for analysing labour market developments. It offers a general characterization of the current state of the labour market, which can function as an introduction to the actual labour market statistics and serve as a frame of reference for more detailed analysis of labour market developments. The fact that it is a graphical device makes it easy to understand and interpret. Using a graphical representation of a coherent indicator set means that a lot of information can be communicated at the same time. Not only about current conditions on the labour market, but also about its structure and important indicators. On the other hand, it can never be more than an introduction to the labour market statistics and an aid in their interpretation. It will still be necessary for most users to consult the actual statistics. Also, as mentioned, the labour market tension gauge views labour market developments purely from a business cycle point of view. For analysing the influence of structural and more long term developments, the actual statistics are crucial.

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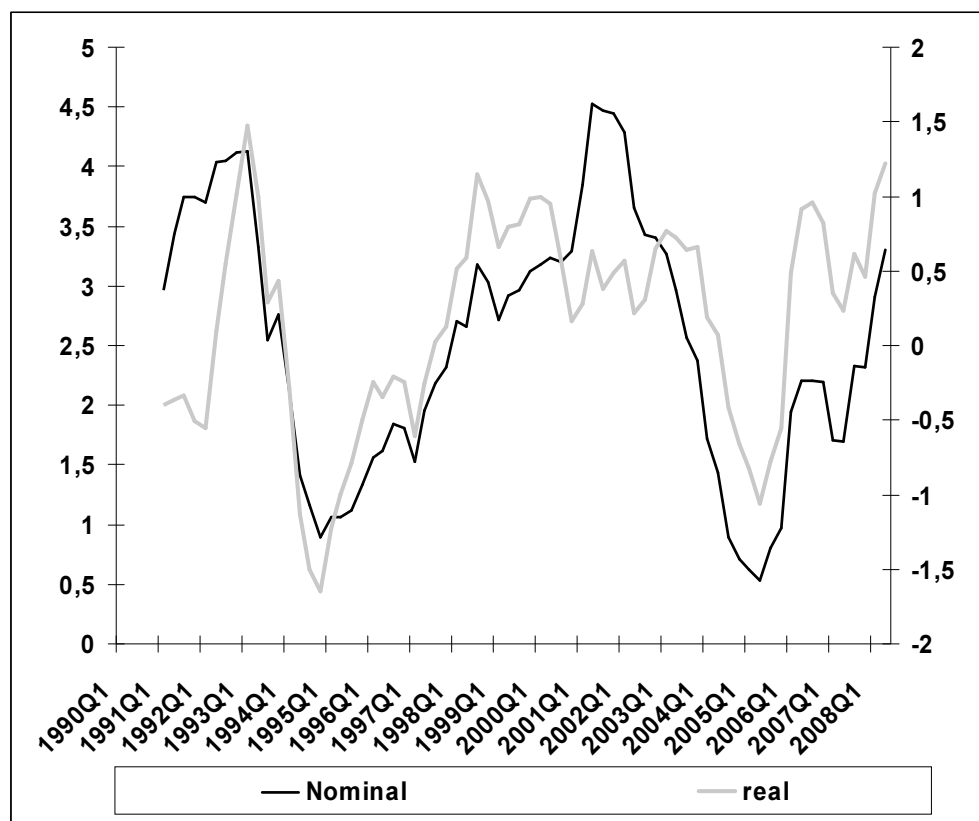
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## **Appendix real vs. nominal wages**

In this study, the growth rate of nominal contract wages has been used as a benchmark for labour market tension. Using wage growth as a, perhaps somewhat lagging, indicator for labour market tension is plausible enough. As in any market, when the available supply of (new) labour is tight relative to demand, prices go up. And when employees fear for their jobs and there are few new jobs available, wage demands will be modest or absent. This positive relationship between labour market tension and wage growth is well founded in theory and empirics [Bridgen and Thomas, Blanchard and Katz, Peeters and Den Reijer, Metzmakers]. Relevant here is that unemployment (inverse labour supply tightness) and growth (productivity) are important determinants of wage growth. These studies tend to use nominal wages, though an inflation variable is entered in the estimated models. In neo-classical theory, only real wages are assumed to be relevant for workers. If economic agents confuse nominal and real developments, this violates the rationality assumption central to the models. This phenomenon, where people imperfectly distinguish between real and nominal developments is termed “money illusion”, and would in this context mean that employees tend to overestimate the real value of their pay rises. This study has used nominal wage growth as an indicator for labour market tension, and for several reasons which will be stated later. The first question here should be: Does it matter from the point of view of labour market tension whether we use nominal or real wages? If real and nominal growth rates exhibit roughly the same pattern (though probably on a different level), it does not matter which one is used to indicate the development of labour market tension.

In graph A1 the nominal and real growth rates of contract wages are shown for the period 1991-2008Q2. As expected, real contract wage growth is always lower, even negative sometimes. The two quantities do show similar development for quite a large part of the period considered, with three of the four turning points in this period coinciding (1993, 1994, 2005). But in other periods, development differs markedly, for example in 1991 and 1999-2003. So the majority of the time, it does not matter much for our purpose whether real or nominal wage growth is used, but overall the difference is real. So why use nominal wage growth?

Graph A1; Nominal growth rate of contract wages (*left axis*, year on year percentage change) compared to real growth rate of contract wages (*right axis*, year on year percentage change)



One argument, though it somewhat results in a circular reasoning, is that the development of nominal wages fits much better labour market tension as derived here, both based on the optimised indicators and based on unemployment and vacancies. This is less trivial than it sounds. Wages are a kind of market price, certainly in a flexible economy. Therefore, wage development should have a clear link with labour supply and demand, and this seems to be more the case for nominal wages. This is confirmed by the strong correlation between the business cycle and nominal wage growth, as shown in section 2. This could be caused by money illusion, where employees focus on the nominal pay rises obtained. There is evidence that this phenomenon is real and widespread [Shafir et al., Fehr and Tyrnad, Yates]. In that case, nominal wage growth is the relevant reference indicator for labour market tension. There is also a supply side argument, which is founded on several macroeconomic theories [Bridgen and Thomas]. In this analysis, firms raise prices when confronted with higher wage costs to protect their margins. Thus, a high-tension labour market which results in higher wages will also result in higher inflation through rising prices. This makes inflation dependent on labour market conditions, meaning that nominal wages are better indication of actual labour market tension.