Introduction

The Data Warehouse (DWH) of the Austrian Public Employment Service (PES) is a Labour Market Monitoring tool, which processes a huge amount of data and is valuable in different aspects and for a variety of potential users. The main purpose of this Labour Market Policy Monitoring device, on the one hand is to provide detailed background information about recent developments on the labour market. This information is included in Career Monitoring and Enterprise Monitoring. On the other hand, it offers sophisticated tools for measuring:

- the participation in different kinds of labour market policy measures,
- the outcome of these measures and,
- the group of participants reached, including information on their employment history.

These issues are addressed in Follow-up Monitoring.

This discussion paper has the aim to highlight some aspects of the implementation of the Data Warehouse of the Austrian PES. This may help to point out the major achievements resulting from the development of the DWH. A detailed description of the DWH, its features and some exemplary analytical utilization are given in the brochure Labour Market Monitoring based on the Data Warehouse of the Public Employment Service (Buzek, A., Edlinger, H., Friedenthal, C., Hochrainer, K., Schmitzberger, F., Tauer, B., Zauner, M. (2004)).

In the first section of this paper I summarise the motivation and reasons why the PES and later also the Federal Ministry for Economic Affairs and Labour (BMWA) engaged in the construction of the DWH. The legal and institutional setting that allowed the establishment of the DWH as well as the amount of resources that has been put into the development are also discussed.

In the second section, I try to depict some of the main problems some of which have already been resolved, but some of which still need to be addressed, in order to establish this monitoring system and keep it functioning. These problems may be associated with technical as much as organisational issues and with questions of the informational content provided. Furthermore, I will mention potentials and limitations of the now existing monitoring tools.

In the third section, I will draw conclusions and discuss some aspects related to the further development and use of the DWH.
1 Background

Policy makers need a basis for the perception of problems as well as for the identification of potential fields of intervention, the definition of objectives and the monitoring of the implementation of measures. A number of recent developments changed the information requirements of the PES and the Federal Ministry for Economic Affairs and Labour (BMWA) as responsible institutions for labour market policy during the last years:

- Austria joined the EU 1995 and implemented ESF programs. Monitoring and evaluation of these programs became necessary.
- The Employment Guidelines were established on Community level and a growing number of indicators have to be reported regularly.
- Growing unemployment and higher expenditures for active labour market policy increased the need to analyse labour market performance and to monitor labour market policy. This in turn widened the gap between information requirements and actually available data, while computer capacities opened new possibilities for data processing.

The DWH, which is in place to meet these information needs, emerged from a rather small tool processing only some of the administrative data sources of the PES onto a data platform. Now the data platform links all the major labour market-relevant administrative data sources available in Austria.

In the first stages of development, the DWH was based only on data generated by the PES itself. Therefore, it reflected only the PES’ own perception of the labour market, especially the labour market performance of the unemployed. A major drawback of the previous information systems was that the activities of the PES – which could be analysed in detail – could not be directly related to labour market performance neither in an aggregated view nor from an individual perspective, following the careers of previously unemployed people or participants in LMP measures.

During recent decades, the main sources of information on the developments in the labour market for the PES as much as for the BMWA, were monthly-published data on employment stocks. These numbers could be broken down by industry, region, sex, age, and other characteristics of firms and workers. This information base was deficient in many aspects: It presented neither labour market flows nor a person- or employer-related view of employment, unemployment or other statuses of an individual working career. This myopic view of the labour market was supplemented by yearly reports on labour market flows and occasional evaluation studies, which were contracted out to private research institutes.

Much of the work done to widen the view of labour market activity used either survey data or administrative data of the Federation of Austrian Social Insurance Institutions (HV). As the administrative databases of social security records include all episodes of social insurance in Austria, this database is huge and needs both appropriate computer hard- and software as well as profound experience on how to use and interpret these data. Only a few institutions were and are able to use these data for scientific purposes. At the same time, access to the social security databases was strongly restricted for data protection reasons. Nevertheless, it became obvious that an integration of different sources of PES data with the social security records of the HV would offer the potential for a quite extensive monitoring system. In particular, not only stocks but also worker flows can be analysed in this longitudinal dataset, and, albeit based on a rather vague definition, employer information is available in longitudinal form as well.
Institutional setting of the DWH-development

The construction of the DWH and its monitoring tools appear as a significant improvement in the information basis of both the BMWA and the PES. Moreover, it was no matter of course to engage in the risky and expensive process of developing a new information platform.

In 1997 the BMWA started a project to calculate follow-up indicators for active measures co-financed by the ESF. This was a first step towards the utilisation of joined administrative datasets, although with limited potential for broader application and less user-friendly design.

The initiative to engage in the development of a more comprehensive data warehouse solution came from experts within the BMWA aware of the potentials of an investment in data availability. The experts in the PES joined in, which was a necessary condition for the success of the DWH project. It was necessary because the PES had already operated the previous versions of the DWH based on the PES data only, and therefore had the know-how as well as the hardware capacity to implement the new development steps using the existing tools. The BMWA, on the other hand, provided the financial resources to the development project, as well as the know-how of the experts who initiated the process. The whole project was set up based on a broad consensus among all stakeholders. Both the heads of the labour market section of the BMWA and the heads of the PES agreed on the usefulness of the DWH-project. The project was outlined in a proposal by the BMWA and additionally justified as a tool for evaluating the interventions of the European Social Funds (ESF) in Austria.

The PES took the lead in the DWH development project and is also the owner the DWH. Based on a support contract, the BMWA has supplied financial resources and owns the right of full access to the DWH. The financial resources allocated to the development of the Labour Market Monitoring amount to about 1.3 million €, partly financed by the ESF.

An Analysis Team was established, in which experts from all institutions involved participated: the BMWA, the PES and the IT Provider that was in charge of the construction of the DWH. The engagement of all three parties and their decision to allocate not only financial but also personal resources to the development of the additional parts of the DWH were critical factors for the success of the project. While the first version of the DWH was established in 1998, the Labour Market Monitoring project was planned in 2000 and the project started in 2001. About 18 people from the PES and the BMWA were engaged in the development of the Labour Market Monitoring, eight of them allocated a substantial amount of their working time to this project. It may be mentioned that for Austria it seems especially unusual that the initiative for a highly innovative development project came out of the administrative authority. Another critical factor was that the development of the enlargement of the DWH could be built upon the existing parts, using the specific experience of the IT division of the PES. Furthermore, the PES pays for the continuous updates and the operating of the extended DWH tools. The yearly additional expenses roughly amount to 21,000 €. The DWH altogether required financial resources of about 12 million €, which is about 3.5 % of the IT expenses of the PES in the comparable time-period.
Data providers and data protection

As mentioned before, the previous versions of the DWH were based on administrative data only stemming from the PES itself. These datasets are still a major component of the current version. In addition, the HV supplies its social insurance record data base, which includes information on insurance episodes and on characteristics of the individuals insured. If the insurance is established in the course of an employment contract, the employer is identified and the wages are reported (up to the maximum contribution base to the social insurance system which is about 4,000 €). The Federation of Social Insurance Institutions (HV) and the PES supply the DWH with at least monthly updates of their databases (wage data can only be supplied yearly, in October of the following year).

The data in the DWH are available in anonymised form: Name, exact address, day and month of birth as well as individual codes like the social insurance number are not observable. Nevertheless, data in the core tables of the DWH are available in individual form, and links between the different databases can be made by using personal codes. These codes are derived from the individual social insurance numbers but cannot (with reasonable effort) be recalculated. The Austrian Commission for Data Protection accepted this procedure.

In the case of external use of the databases, or of parts of them, additional contracts are concluded to prohibit misuse of the data (i.e. trying to de-anonymise them).

2 From administrative social insurance data to a labour market monitoring system

The advantages of combining PES data with data from the social security records administrated by the HV justify the investment in the DWH as comprehensive information tool. The DWH is not located at Statistics Austria (the Austrian statistical office), but at the PES and its superior authority (the BMWA). This solution has the advantage, that the PES data are produced in their own sphere and that the previous DWH systems could be extended to incorporate the additional datasets, in particular the social security records from the HV. The use of administrative data for other applications than they are collected for requires attention to what the collection of these data was initially intended for, and a careful definition of what the data shall reflect after their adaptation. Additionally the datasets in question are huge and therefore require suitable IT solutions.

Altogether, the development process of the DWH monitoring tools can be divided into three tasks:

- Make data available and organise and join individual information items.
- Translate the administrative data into labour market relevant facts.
- Design software and define indicators to supply easy access to the information contained in the data.
Availability and integration of administrative datasets

Individual work histories from social security data have been available in Austria for several years, just as in other countries like Germany or Belgium. In the case of Austria, these data are organised in insurance spells, which are qualified in regard of the different reasons for the creation of an insurance liability. There are all together more than 200 such insurance qualifications. Some of them are due to employment and can be distinguished between dependent employment (employees), self-employment, marginal employment and other kinds of atypical employment arrangements. Concerning dependently employed, one can distinguish between different occupational statuses like blue-collar and white-collar workers, civil servants and apprentices. Except for some of the civil servants, the dataset comprises all Austrian workers and all of their insurance spells. Spells of benefit payments like old-age pension, invalidity payments, unemployment benefits, child-care allowance and others can also be observed. Unfortunately, employment spells have no information on working time arrangements.

As the social insurance data are recorded on a daily basis, they offer a longitudinal dataset and (in their utilisation within the DWH) cover insurance spells back until 1997. In addition to the information on the insurance spells, individual characteristics like age, sex, nationality and employer characteristics like industry affiliation and location (not for public sector employment) are directly observable. Other characteristics can be calculated, for instance:

- firm size (number of employees);
- job and worker flows at the firm level or the individual level;
- days in gainful employment, in unemployment, out of the labour force; and
- job tenure.

An additional set of information includes yearly salary earned in each job (for dependently employed but not for civil servants). The income data are right censored because of the social security contribution cap, which applies to less than 10% of the cases. This salary database can be linked to the employment spells and, by doing so, reasonable estimates of wages per day or month of employment can be calculated. Subsequently it is possible to build indicators at individual or firm level, such as firm wage level or dispersion.

Besides the data of the HV, the DWH comprises datasets taken from the operational data of the PES. As with the social insurance records, they are longitudinal with daily information reaching back until about 1997. Among others, these include data on the:

- status of registration at the PES (e.g. unemployed, in training);
- cases of treatment (e.g. different types of training, wage subsidies);
- unemployment benefits; and
- individuals registered with the PES (e.g. age, sex, region, nationality, level of education, previous occupation).

The PES databases and the social insurance database can be linked using individual codes, and so indicators can be calculated using the whole set of information in all of the datasets.
One innovative element of the Labour Market Monitoring is to bring these large datasets together in the DWH, to organise and link them, to guarantee monthly updates and to solve data protection issues.

Definition of labour market relevant issues

The DWH in its current stage bases its calculations on the datasets mentioned above. These datasets are generated for administrative purposes, and the units observed are individual persons, firms and labour market states (employment, unemployment etc.). Administrative data usually have high reliability as long as the information collected is relevant for administrative purposes (e.g. duration of insurance spells or the type of insurance coverage). If this is not the case, information might become less reliable (e.g., there is no clear definition of establishment or plant since it is irrelevant to the social insurance). Since the data are not collected for labour market monitoring or for scientific use, there are a lot of variables missing which would be of interest for these applications; an extension of the set of variables in the administrative data is usually not possible. A major drawback of the social insurance data is that it contains very few individual characteristics: e.g., there is no information about the education level or the place of residence.

Since information can be observed individually and longitudinally, a lot of potential fields of application are open to the user. However, at the same time this results in very high complexity. Additionally, the social security records do not necessarily and directly reflect the individual employment situation. The individual social insurance records, for instance, contain everything that might be relevant for the calculation of public pension payments.

A lot of work has to be done to adapt the data to become useful for labour market monitoring purposes. This implies in the first place that one has to define which types of insurance episodes (as mentioned before, there are more than 200 types of registration in the insurance database of the HV) reflect certain types of employment, of unemployment, of periods of social insurance benefits etc. As there are a number of different data sources and also various institutions that administrate them, the data are in some cases contradictory. Therefore, rules have to be established to generate a consistent view. Furthermore, to establish a view of the labour market performance of individuals or establishments, insurance records have to be aggregated and prioritised, again following reasonable rules.

For Labour Market Monitoring purposes, data are first prepared on an individual level: For example the tables for career monitoring are generated by combining information from the different databases, ensuring consistency, i.e. resolving possible contradictions, and prioritising the different labour market statuses to one dominant status for each day. Several other similar data operations provide the basis of the DWH and its Monitoring Systems.

The second innovative element of the Labour Market Monitoring is that data are processed in an intelligent way. Important outputs are tables that still contain individual information. In these output tables, some of the drawbacks of the administrative character of the information have already been overcome. This is not only important for the monitoring systems but these tables also offer an additional possibility for the PES and the BMWA to investigate the data in analytical ways which the final (aggregated) output tables of the monitoring systems do not allow. Additionally, these pre-prepared data could also be used for scientific purposes. The use of individual data for labour market research could be strongly encouraged by the possibility for researchers to get easy access
to these data tables. The PES and the BMWA would be able to profit from such an improvement of the research potential.

Research work undertaken by various institutes making use of the described administrative data sources (HV, PES), show how empirical labour market research in Austria could be extended. I will give some examples of research work carried out in recent years based on the analysis of data from social insurance records. Hofer, H., Winter-Ebmer, R. (2003) also mention some of these publications in a paper on Longitudinal Data from the Social Security Records in Austria.


Definition of indicators and design of software solutions

The last step from the raw administrative data to a monitoring system is the definition of labour market indicators, and the design of a software application allowing easy access to often-used types of indicator tables. Having the huge number of possible uses in mind, there is a trade-off between comprehensiveness and simplicity, which has to be solved. If the design tends to a simple monitoring tool, fewer questions can be answered but many people will be able to use it with only low expenses for training. A more comprehensive tool will be able to answer more or more complex questions at the cost of more training requirements and less potential users. The DWH Labour Market Monitoring goes quite far in the direction of a complex tool designed for experts with broad background knowledge of technical details and in labour market analysis (but it provides some so-called ‘light-cubes’ for easy usage as well). Within the DWH Labour Market Monitoring different specific aspects of the Austrian labour market are provided in three monitoring modules: follow-up monitoring, career monitoring and enterprise monitoring.

Follow-up Monitoring

Follow-up monitoring provides a variety of output indicators of different PES treatment measures. An instructive example, in which the careers of participants in a wage subsidy scheme are analysed, is given in chapter 2 of the brochure on Labour Market Monitoring. This example shows very well that different types of indicators (volume shares, (re-)entry into the labour market, income development) are applicable. Additionally, the authors disaggregate their analysis into useful subgroups of participants. They distinguish not only by individual characteristics like age, sex or disability but also by characteristics of the treatment (duration) and of the pre-treatment career

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2 This list could be continued at length.
Another tool for comparing the significance of the (re-)integration problems is the possibility of presentations of pre-treatment periods and of post-treatment periods.

Besides the potentials, chapter 2 of the brochure on the DWH Labour Market Monitoring also describes the limitations of the follow-up monitoring. In this respect, it is essential to stress the distinction between outcome and impact of a treatment. Estimating the impact of a specific treatment is founded on a causal relationship between treatment and impact whereas there is no necessity of a causal relationship between treatment and outcome. Causality is often captured by looking at a contrafactum at the microeconomic level (social experiments, control-group). The (simple) comparison between pre- and post-treatment careers might serve as a coarse counterfactual proxy in some cases. However, this approach disregards the fact that the labour market performance of participants changes over time – also due to various other reasons than the respective treatment. Therefore more elaborated evaluation methods call for constructing control groups and comparing them with the treated groups. The access to labour market measures of the PES is often restricted to certain groups of unemployed, and unemployment duration is often one important selection criterion. This again makes the interpretation of the career before and after the treatment less informative with respect to impact estimations.

Nevertheless, the follow-up monitoring offers an enormous amount of information on the treatment, its participants and their pre- and post treatment careers. Thus, it improves the information available at a monthly level dramatically and there is a range of applications for the input and outcome indicators of this monitoring module. The comparison between the outcomes of labour market policy measures of different regions may be one example for useful application, subject to the condition that the indicators are handled with care.

A further issue raised in the brochure on the DWH Labour Market Monitoring is the necessity of a sensible use of the indicators. Common arguments against quantitative indicators for policy assessment stress that the composition of participants or implementation conditions might vary even if the measures are the same and that qualitative aspects of the outcome or the impact of a treatment are not captured in quantitative indicators. None the less, it would be unwise not to use available information only because there are other areas, where information is more difficult to obtain.

In any case, the sensible use of the information provided by the DWH opens a range of possibilities for analysing, understanding and steering of labour market policies. At the same time it might also offer a source of information for further analysis e.g. for the evaluation of the individual impact of labour market measures.

Altogether, the use of the follow-up monitoring is very demanding for technical reasons and even more for reasons of an adequate use in terms of interpreting the results. Chapter 4 of the brochure shows an example where wrong conclusions could have been drawn if the authors had not been very well-informed about the measures they analyse: The evaluation done with the parental leave monitoring (which is an application of the follow-up monitoring) indicates a high percentage of women who exit parental leave after less than a year, for 2002. This was the first year that the extension of the period of child-care allowance affected all parents. The monitoring results would

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3 Parents whose children were born at 1 July 2000 or later are affected by the extension of the benefit period from 1.5 to 2.5 years. Consequently, there were very few exits from parental leave because most parents (mostly mothers) extended their parental leave as far as possible.
suggest that the change in the arrangements of the child-care allowance results in shorter periods of parental leave, and reduces the interruptions in the employment participation of mothers. This conclusion would be entirely wrong and, of course, it is correctly rejected by the authors of the brochure. Evaluations have shown that the opposite is true: The extension of the maximum benefit duration for the child-care allowance delays the return of mothers into the labour force (see Lutz (2004)).

Career monitoring

Career monitoring is the second part of the DWH Labour Market Monitoring. Its aim is to allow a routine for looking at labour market dynamics. It is based on both the PES data and the data from social security records. As mentioned in the above sections, the observation of an individual career requires aggregating the data and the setting of priorities between parallel episodes in the raw data. Career monitoring makes use of the definitions already set in the preparation of the databank tables in the DWH: for each person in the database, a dominant status is defined for each day, thus reducing complexity through making the database free of overlaps (multiple episodes at the same time).

Career monitoring offers a significant extension of the periodically available data for labour market analysis and policy consulting. Achievements of this monitoring tool are:

- a nearly complete presentation of registered employment, unemployment and certain out of labour force statuses (e.g. pension, parental leave);
- the option of analysing the employment status of individual people not only by the number of ongoing employment spells (jobs), as in the monthly employment data published by the HV;
- observations of small jobs (marginal employment) and child-care allowance in parallel to other statuses;
- the possibility of analysing and relating stocks and flows;
- the highly disaggregated levels of the data which can be broken down to certain socio-demographic groups or to types of enterprises (e.g. by industry).

Probably, to a greater extent than follow-up monitoring, career monitoring is the appropriate tool for generating a set of informative tables, which may be used as a kind of standard report. Such monthly or yearly reports could act as the standard periodical labour market information used by experts as well as by politicians or journalists. As an example for applications of the career monitoring module, the DWH-team experts discuss a labour market balance in chapter 5 of the brochure on the Labour Market Monitoring. The monthly official data on unemployment are already calculated within the DWH. Nevertheless, career monitoring offers a multitude of additional reporting possibilities. Therefore, it is quite a complex tool, which needs experts to use it, just like the other monitoring tools of the DWH. Because a substantial part of the population is included in the career monitoring module and because the dimensions and indicators are numerous, the data processing and calculations of the career monitoring module are also a challenge for the hard- and software it is based on.

There are some major drawbacks of this monitoring module: Until now, longer time series of indicators, which would allow for improved interpretation, are not available. As pointed out before, the data from the social security records do not include education level and place of residence of individuals, as well as working time information on the jobs. To at least partly overcome these
drawbacks, an extension of the career monitoring module would be necessary (see also Chapter 7 in the brochure on Labour Market Monitoring). Concerning education levels and working time, a general comprehensive recording of this information in databases should be implemented in Austria as soon as possible.

**Enterprise monitoring**

In its current form, enterprise monitoring as the third part of the Labour Market Monitoring is somewhat less developed than follow-up and career monitoring. Nevertheless, it is an integral component of the monitoring system and adds a very interesting aspect to it. In the last decade a body of research literature has emerged, which focuses on empirical labour market research based on linked employer-employee data (see e.g. Davis, S. J.; Haltiwanger J. C. (1999)). Although the data from the social security records offer very few employer characteristics and despite the imprecise definition of ‘enterprise’, some elements of employer information can be used in combination with employee-related data. For instance, labour market dynamics can be analysed looking at individual workers and enterprises together (see e.g. Huemer, U., Mahringer, H., Novotny, B, Smeral, E., Smeral, K. [2004]).

In Labour Market Monitoring, enterprises can be categorised, not only by industry and by size, but also by their employment stocks, growth, and turnover. These numbers can be broken down by job characteristics (e.g. the type of employment), by individual characteristics (e.g. age and sex) and by employer characteristics (e.g. industry and region).

Until now, enterprise monitoring is based solely on the data from the social security records. A link to the enterprise information of the PES is planned for the near future. An extension of enterprise monitoring would be very promising, especially if it included databases with additional information on some economic indicators such as sales, profits, exports, investments, expenses for R&D or further training. Linking the DWH data, for instance, to enterprise registers like the one of Statistics Austria could be a promising extension of the enterprise monitoring.

As in the other parts of the monitoring, the employer data in the enterprise monitoring have to be handled with care. Data on the location of enterprises are not reliable at the district level, and as pointed out before, the definition of ‘enterprise’ is not clear in this dataset. Enterprises often have several employer accounts e.g. for every plant, others register all of their employees on a single employer account. Furthermore, there is evidence that employer accounts may change, which looks in the data like a shut down of one enterprise and a start-up of another. There are some methods to control for this problem (see Huber, P. et al. [2002]), but the use of a more reliable employer register would improve the database considerably.
3 Conclusions and future perspectives of development

Utilisation of the Monitoring within the PES and the BMWA

The Labour Market Monitoring of the PES proves to be a significant improvement of the information basis. The BMWA and the PES can use this tool as a basis for planning and monitoring their policies. The PES has already started to implement this new source of information in its planning and monitoring processes. For the PES, follow-up monitoring seems to be most relevant. Different types of measures are analysed with respect to their outcome. It has not been decided how the information of the DWH will be integrated into the target indicators for single measures, for the regional organisations of the PES or for the PES as a whole. In any case, the PES will make use of this additional tool (e.g., in its AMS-score card, currently under development). The PES has already started to train the relevant staff members (by now about 80 people) on the new monitoring system.

The DWH monitoring tools are a significant improvement to the database, which the BMWA can utilise for policy planning. The brochure on the DWH Labour Market Monitoring shows that the new tools are applied competently and offer relevant information for the requirements of the BMWA experts. Besides the day-to-day work, the DWH is also used for some analytical work done by the labour market department (Sektion II) of the BMWA and for the calculation of the indicators for the National Action Plan on Employment (NAP). Both follow-up and career monitoring are highly relevant for the BMWA. The role of enterprise monitoring will probably grow with its further development (it is currently used mainly as an operational device and planning tool in the PES).

The design of the DWH and its monitoring tools are very complex, reflecting the complexity and comprehensiveness of the underlying databases. Therefore, a rather small number of experts will be in a position to make adequate use of Labour Market Monitoring. Even for these experts it is almost impossible to keep all of the definitions and conventions in mind that are necessary to interpret the monitoring results in all of its potential dimensions. Therefore, the documentation of the monitoring and of each step in preparing the database, play an essential role for its use and the further development.

Potential users of the DWH and its monitoring in research

The potential users of the DWH are far more than only the PES and the BMWA. In particular, the access of researchers to the databases behind the Labour Market Monitoring would improve the availability of labour market data significantly. Moreover, different research projects could start from a common database. Nevertheless, competent use of the data by researchers is an inevitable and necessary condition. Therefore, an understanding of the data and the capability to handle them is required. Finally, the question of data protection has to be solved. The evaluation of the interventions of the ESF Objective 3 in Austria serves as a first example for the use of the DWH data for research. It shows that the investment in the DWH also improves the potential for scientific evaluation of labour market interventions.

Both the BMWA and the PES can gain from the scientific analysis of the Austrian labour market. Consequently, there are already plans to open some of the databases for researchers in the near future.
Perspectives of further development

Currently the Labour Market Monitoring of the PES makes use of its own data and of the data from the Social security records. There are additional data sources that might be able to improve data quality or to widen the content of the possible analysis. I have already mentioned that it is planned to include the enterprise data from the PES into the monitoring. Furthermore, population or education register data could contribute to overcome some of the drawbacks of the existing monitoring system.

Since the HV data do not cover wages of civil servants and the income from self-employment, and since the wage data are right-censored due to the social insurance contribution cap, tax data on labour income could improve the quality and comprehensiveness of these aspects in the monitoring.

As pointed out in the previous chapters, enterprise monitoring could gain from additional information on some economic indicators. Linking the DWH with data from enterprise registers could help in this respect. However, the existing link between employer and employee data already offers many applications.

One interesting direction of development would be a combination of the DWH data and the Labour Force Survey. Both databases serve as sources of official labour market statistics: The one is based on administrative data, the other on a survey. Therefore, an integration would offer very interesting features.

It is a still open question, how far a pre-prepared monitoring system should go. Answering it, one should keep in mind the trade off between complexity and easy use. If the database underlying the Labour Market Monitoring grows in size and potential, the design of an easy-to-use monitoring system will reach its limits.
References


