Marcus Scheiblecker

The Working-Day Effect in the Austrian Economy

Gross domestic product (GDP) measures total production of an economy. In Austria this aggregate is recorded on an annual as well as on a quarterly basis. An inspection of the quarterly figures makes it clear that this series is subject to substantial subannual variation. One of the reasons for this phenomenon is – beside the seasonal movement – the variation in the number of working days. As the length of the observed interval rises, the relative size of the irregular component decreases – thus, in general, monthly data are more strongly affected than quarterly data, which in turn are less strongly affected than yearly data.

Marcus Scheiblecker is an economist at WIFO. The author is grateful to Thomas Url and Michael Wüger for useful and constructive comments. The data were processed and analysed with the assistance of Christine Kaufmann • E-Mail-addresses: Marcus.Scheiblecker@wifo.ac.at, Christine.Kaufmann@wifo.ac.at

In order to answer the important question as to the economy's phase in the business cycle, it is necessary to isolate seasonal as well as calendar effects – to which working days belong – from the rest of the series. The simplest method of eliminating the effect of a variation in the number of working days is the division of measured production by the number of working days. This method estimates the effect of a single working day on production and yields € 810 million per working day in 2002 (248.5 working days total).

The disadvantage of this trivial method is the implicit assumption that each additional working day has exactly the same quantitative effect[1]. This stands in stark contrast to the observation that an additional working day in a month or quarter usually increases production by far less than working days on average. An additional drawback of this approach is that it remains unclear whether production, as measured according to the national accounting rules, is related to the number of working days at all. In the non-market sector, for instance, to which public administration belongs, value added is determined by convention by its costs. As the cost component "wages and salaries of civil servants" does not depend on the number of days worked, the same production would result if the number of working days were smaller. In this case a division by the number of working days would be the wrong method to determine the working-day effect.

In order to estimate this effect in a proper way, an adequate method of isolation is needed, as these effects are not directly observable. The usual way of presenting a time series to be corrected for separate effects is as the sum or product of a trend-cycle component (TC_t), a seasonal component (S_t) and an irregular one (I_t):

$$Y_t = TC_t + S_t + I_t$$

or as a multiplicative model

$$Y_t = TC_t \times S_t \times I_t .$$

Nearly all of these models assume independence of the components of each other (assumption of orthogonality), which is hard to maintain in reality[2]; this has to be kept in mind when interpreting the results.

[1] On this see the section on non-linearities.

[2] For the extent of seasonal and business cycle interactions in European industrial production see, for instance, *Matas Mir – Osborn* (2003).

Each of these main components can be separated into subcomponents. The trend-cycle component can be split up into a long-term trend and the business-cycle component (see, e.g., *Scheiblecker,* 2002)[3]. The seasonal component S_t can be subdivided into the season in the narrower sense and calendar effects, which are not stable over the year.

The seasonal effect narrowly defined is quite stable[4] regarding its time of occurrence, its direction and its extent. The reason for this kind of variation lies in natural phenomena like the weather, administrative or legal conditions – e.g., fix taxpaying days – social and cultural traditions and calendar effects with a fixed date (e.g., Christmas).

There are calendar effects belonging to the seasonal effect in the wider sense, which are characterised by the fact that the period of their occurrence can vary from year to year. These calendar effects can be further split up into several components[5]:

- The Working-day effect is the effect of variations from year to year in the number of working, or trading, days and the weekday composition for a particular month or quarter relative to the standard for that particular month or quarter[6].
- The Easter effect comprises all effects which occur regularly but not necessarily in the same period. This is the case for the Easter holidays and the Holy Week, which are situated either in the first or second quarter of the year.
- Other calendar effects are, e.g., the leap year effect, which every forth year extends the first quarter by one day, and the length-of-quarter effect.

The irregular term – containing all unpredictable and not yet covered factors – can be split up in the same manner as the trend-cycle and the seasonal component in the wider sense. According to the proposed model for isolation, all components, the irregular component narrowly defined, which ideally is just "white noise", as well as additive outliers (e.g., due to natural disasters and other singular occurring events) detected by the software belong to this term. Automatically detected level-shifts are assigned to the trend-cycle component, however.

In the modern economic literature two different approaches for isolating each effect have evolved: the structural time-series model (*Harvey,* 1989) and the Auto-Regressive Moving Average model (ARIMA; *Gomez – Maravall,* 2001). Both procedures have the advantage that all components are estimated simultaneously, which ensures internal consistency of the results[7].

The first method models each component separately; this is done either by deterministic or stochastic processes[8]. The second method, which is the approach chosen for this study, describes important components of the time series as ARIMA models (here for the trend-cycle as well as the seasonal component). Both methods belong to the class of "Unobserved Component Models", as components which cannot be directly observed are estimated.

Taking into account all subcomponents of a time series an ARIMA model (P, D, Q) (p, d, q) is estimated, where (P, D, Q) represents the regular ARIMA model used for estimating the trend-cycle component and (p, d, q) the ARIMA model for the seasonal component[9]. In a first step all deterministic effects like working days, Easter and leap-year effects, outliers and effects captured by specially introduced regression variables (e.g., average daily temperature in degrees) are eliminated by

[3] This separation is an important field in business cycle analysis but is not within the scope of this article.

[4] In some models the seasonal component is also allowed to vary over time.

[5] This taxonomy follows the suggestions of *Bloem – Dippelsman – Maehle* (2001).

[6] The period-to-period variation in the standard, or average, number and type of working days for each particular month or quarter of the year is part of the seasonal effect narrowly defined.

[7] In other ad-hoc methods the sum over all components is possibly different from the original series.

[8] For Germany, *Flaig* (2000) applied a stochastic model to quarterly GDP.

[9] The parameters P and Q represent the order of the regular, p and q of the seasonal autoregressive or Moving-Average term, respectively. D and d is the order of the differencing process necessary for obtaining stationarity.

recursively testing a seasonal ARIMA model for the remaining components. This can be written in differences as

$$\phi(B)\,\Phi(B^s)\nabla^d\,\nabla_S^D\,z_t = \theta(B)\,\Theta(B^S)\varepsilon_t\,,$$

where $\phi(B)$ and $\Phi(B^s)$ represent the regular and the seasonal AR-polynomials respectively, $\theta(B)$ and $\Theta(B^S)$ the regular and seasonal MA-polynomials. ∇^d and ∇_S^D indicate the order of the differencing process necessary for obtaining stationarity in the regular and seasonal ARIMA part. ε_t refers to the noise $(\varepsilon_t \sim \mathrm{nid}(0,\sigma_\varepsilon^2))$ and B represents the so called lag or backshift operator for which holds

$B\,z_t = z_{t-1}$ or $B^5\,z_t = z_{t-5}$, respectively.

In the following, an analysis of these components is carried out on a quarterly basis for the Austrian GDP according to the proposed method. It aims at isolating the effect of variations in the number of working days on real total production. Due to the fact that the year 2004 has three working days more than 2003, the quantification of this effect possesses relevance for interpreting the economy's actual position in the business cycle. In Germany, the year 2004 has even four working days more and studies show that this will raise GDP by 0.6 percent, which is half the growth rate of most forecasts for this period[10].

As already mentioned, one important drawback of this kind of analysis is the assumption that all components are independent of each other, even though they are estimated consistently. This "orthogonality assumption" alleges that the working-day effect is independent of the phase of the business cycle. This holds for nearly all model-based procedures as long as this non-linearity is not considered explicitly.

Software Used

The demand for the publication of seasonal and working-day adjusted economic time series has expanded steadily in recent years. In order to meet this demand, several comfortable software packages have been developed, which allow an efficient but still qualitatively sufficient sound extraction of components. Two, which have proved best in the past, are X12-RegARIMA and TRAMO-SEATS (*Gomez – Maravall,* 1996). Whereas the X11 and X12 family use deterministic filters for seasonal extraction, TRAMO-SEATS applies a factorisation of the estimated seasonal ARIMA model.

On theoretical grounds, WIFO has chosen TRAMO-SEATS as its main instrument for seasonal adjustment (*Wüger,* 1995A). The econometric estimation was done by the software TRAMO-SEATS, with the version available in Eurostat's program package DEMETRA (version 2.0, Service Pack 1). This software was especially designed for seasonal adjustment of time series and is also capable of detecting working-day effects. The official quarterly national accounts framework for Austria, starting from the first quarter of 1988 and ending with the second quarter of 2003 – as published by the end of September 2003 – constitutes the database. As a consequence, 62 observations were available, which marks the lower boundary for time series analysis (the reliability of identification of working-day effects diminishes as the number of observations decreases).

In this analysis, the estimation of the extent of the working-day effect in Austria will not only be done for quarterly GDP as a whole but also for all contributing sectors. This method has not only the advantage of tracking the formation of the effect for the entire economy, but is essential for checking the reliability of the results. It is quite reasonable to assume that the different working-day effects in the various sectors, which vary in terms of intensity and sometimes also in direction[11], are amplified or muted by summation, which impedes the proper isolation of these effects. In an

[10] The German Economic Research Institute DIW (press release of 1 July 2003) estimates that the four additional working days in 2004 will contribute 0.6 percent of total GDP, the official Gemeinschaftsgutachten of the most important German economic research institutes assumes 0.5 percent. In its autumn forecast 2003 the EU Commission ascribes to this effect one third of the forecasted growth rate of 1.6 percent for Germany. Another study for Germany, *Flaig* (2000), also yields an estimate of 0.5 percent.

[11] A potential working-day effect in the tourism sector will probably have a negative sign, as tourism profits from non-working days.

optimal setting, separate working-day calendars are available for each branch; for example, the number of working days differs between trade and manufacturing.

The working-day effect estimated in this study conforms in so far with the definition given above, as only deviations from the average number of working days are taken into account. In other words, the working-day effect is formed only by the variation in the number of working days from period to period.

The economic-policy question to what extent the (permanent) abolition of a public holiday might lead to higher production can not be answered adequately with this method: this is not the case of a (temporary) variation from period to period.

The difference between the two scenarios becomes immediately apparent if we take groceries as an example. It can be observed that an additional trading day leads to higher turnover but keeping shops open on all days of the month would not increase the turnover to the same extent as consumers will spread their food purchases over all days.

A strike also means a loss in working days. Here too, the proposed method is not appropriate for evaluating the possible loss caused by this event. From the fact that in an industry work is organised in shifts over the whole week and production is therefore independent of the number of working days it can not be concluded that a day of strike will not have an effect on output. Moreover, backlogs in production caused by singular events like strikes and natural disasters are in most cases made up in the following days by supplementary working hours or increased efficiency. By contrast, this is not the case for the variation in working days in the definition of the present study.

For the analysis of the working-day effect on total GDP, an ARIMA (0, 1, 0) (0, 1, 1) model has proved most adequate. This corresponds to a seasonal Moving-Average model with first and forth differences.

Table 1: Gross value added by branch, Austria and Germany 2002

At constant 1995 prices

	Austria		Germany	
	Total value added	GDP	Total value added	GDP
	Percentage shares		Percentage shares	
Agriculture and forestry	2.5	2.3	1.3	1.2
Manufacturing	21.0	20.0	20.8	20.1
Mining and quarrying[1]	0.3	0.3	0.2	0.2
Electricity, gas and water supply	3.1	2.9	2.1	2.0
Construction	7.1	6.7	4.7	4.5
Wholesale and retail trade[2]	13.0	12.3	9.9	9.5
Hotels and restaurants	3.9	3.7	1.1	1.0
Transport and communication	7.6	7.2	8.4	8.1
Financial intermediation	7.1	6.8	5.8	5.6
Real estate, renting and business activities, consulting[3]	15.5	14.7	25.3	24.4
Public administration[4]	5.7	5.4	5.7	5.5
Other services	13.4	12.7	14.9	14.3

Source: Statistics Austria; Statistisches Bundesamt Wiesbaden. – [1] Including quarrying of stone and ore. – [2] Including repair of motor vehicles, personal and household goods. – [3] Including renting of machinery and equipment and business related services. – [4] Including defence and compulsory social security.

The result indicates that a 1 percent rise in the number of working days increases real GDP by 0.05 percent, which is approximately € 100 million. With an average of 248.6 working days per year, one working day represents 0.4 percent, which means that one additional working day leads to a rise in real GDP of 0.02 percent or € 40 million, respectively. The total effect of three additional working days in 2004 (compared to 2003) cumulates to a supplementary production of € 120 million. Neither the Easter nor the leap-year effect shows up with the desired level of significance.

Compared with the estimates of the working-day effects for Germany (up to 0.6 percent of GDP), this effect seems surprisingly small. One reason for this difference could be differences in the structure of both economies. It could be the case that the relative importance of Austria's tourism sector – for which a negative sign of the working-day effect seems to be possible – dampens the total effect. Differences in the size of the manufacturing sector (for which this effect is assumed to be high) or the public sector might also be relevant. According to the box "Software Used", there are actually no substantial differences between the contributions of goods production and public administration to the GDP between both countries. The largest discrepancies show up in the area of "real estate and renting". Thus, in the following sections, all branches contributing to real GDP are analysed separately on the basis of NACE-sections.

Agriculture and forestry

According to ESA 95, production of agriculture and forestry (NACE A + B) is not determined by the harvest, but by the growth of agricultural products. As a consequence, production is not determined by the number of animals slaughtered but by the growth of the animals. Equivalently, timber production in the forestry sector is not determined by the volume of trees cut down – which represents only a depletion of stocks – but by the growth of timber on the living trees.

According to expectations this branch shows no working-day and Easter effect. Theoretically a leap year should have an effect on production, as there is an additional day in February. This effect could not be detected either. Perhaps the quarterly data are not fine enough for the detection of the effect of a single additional day every four years.

Mining and quarrying

As in agriculture and forestry, only a significant seasonal effect shows up in the mining industry (NACE C). This is not astonishing as production of this industry (e.g., the oil production) also takes place at weekends on the whole.

Manufacturing

Manufacturing (NACE D) contributes the largest part to total real GDP in this single-digit classification. A significant working-day effect has been detected, although it is relatively low. A quarter with an additional working day leads to a rise in real value added in the goods production of € 56 million. This is equivalent to ½ percent of quarterly real value added or 0.1 percent of quarterly real GDP. In a year with three additional working days, the corresponding gain in real value added would amount to 0.4 percent.

Neither a statistical significant Easter nor a leap-year effect was found. Whereas the latter can possibly be attributed to the quarterly aggregation level, which seems to be a yardstick too rough for the detection of this kind of effect, the first can possibly be explained by balancing processes based on changing productivity[12].

Electricity, gas and water supply

In the electricity, gas and water supply industry (NACE E) a positively working-day effect was found: 1 percent more working days increases production by 0.16 percent. But this result is not sufficiently reliable.

Theoretically a working-day effect in this branch seems to be plausible, as energy and water consumption on working days is usually higher than on non-working days and consumption determines production in this area.

Construction

Surprisingly, real value added in the construction industry (NACE F) does not reflect a variation in the number of days worked. Theoretically, a positive working-day effect can be regarded as plausible, as the largest part of the building sites is closed on weekends.

[12] In some branches where final products are storable, work ahead of schedule is often possible as well as the temporary substitution by colleagues who are not on holidays.

Wholesale and retail trade

On a quarterly basis no working-day effect was found in real value added in the wholesale and retail sector (NACE G). In retail trade, the number of trading days is more important, but as *Wüger* (1995B) showed for Austria this kind of effect can only be analysed properly on a monthly basis.

However, a significant Easter effect was found even on a quarterly basis. Value added is significantly higher in those quarters which include the Holy week and Easter holidays; this effect can be explained by tourism activities.

Hotels and restaurants

In the hotels and restaurants industry, which is quite important for Austria's economy, a negative working-day effect can be expected. The fewer working days in a quarter the higher the number of days available for going on holidays, which positively influences value added of the whole tourism sector. The statistical analysis yields only a significant Easter effect on a quarterly basis.

In order to check this surprising result with another time series, an analysis based on the number of overnight stays – also on a quarterly basis – was carried out. Once again, there are no indications of a negative working-day effect.

The reasons for this result could be once again the quarterly aggregation level or an inappropriate calendar. As about half of the revenues in this sector come from exports, production is only partly influenced by domestic working days. In order to capture the working days determined by the calendars of foreign countries, a weighting of all this calendars would be necessary.

In order to investigate the extent to which the quarterly aggregation level puts a veil on the working-day effect, an analysis of overnight stays was carried out on a monthly basis. This confirmed the above-mentioned suspicion and this time a significant working-day effect, with the theoretically expected negative sign, was detected. A rise in the number of working days by 1 percent lowers overnight stays by 0.4 percent. This result can not be easily applied to value added[13].

Transport and communication

Due to a very fragmentary and incomplete quarterly database available for the calculation of value added in the transport and communication industry, quarterisation methods have to be applied to arrive at quarterly figures for value added: by definition, there are neither seasonal nor working day components. On theoretical grounds, a variation in the number of working days could play some role in the generation of value added, as demand for transport services as well as for communication activities should be higher on working days.

Financial intermediation

In the area of financial intermediation (NACE J) neither a working-day nor an Easter or leap-year effect was found. In fact, banks' interest margins should not be influenced by the number of working days, but the volume of fees and other revenues is likely to be linked to the number of working days. With the appearance of alternative forms of relations between banks and customers (e.g., via internet or telephone) this effect should now be lower than in the past[14].

Real estate, renting and business activities, consulting

The category "real estate, renting and business activities, consulting" (NACE K) consists of real estate services in the narrower sense – where value added is generated mainly by collected and imputed rents – and other important branches like business related services, other rental activities, research and development and data bank services. Whereas in the area of rentals no relevant working-day effect can be expected – because these are usually calculated on a monthly basis – business related services may show this effect. This component includes legal advice

[13] Under the assumption of a constant relation between value added generated by hotels and restaurants and overnight stays, the negative working-day effect (–0.4 percent overnight stays per additional working day) lowers total GDP in 2004 by € 38 million.

[14] For the decrease of the effect of bank holidays on the stock market turnover see *Vergin – McGinnis* (1999).

and business consulting, cleaning and personnel leasing services, etc. Nevertheless, a significant working-day effect was not detected. The quarterly base as well as the large weight of the included rental branch may account for this finding.

Table 2: Working-day effect by branch

	Working-day effect Million € per working day
Agriculture and forestry	.
Manufacturing	.
Mining and quarrying	56***
Electricity, gas and water supply	2.4*
Construction	.
Wholesale and retail trade	4.5*
Hotels and restaurants	.
Transport and communication	.
Financial intermediation	.
Real estate, renting and business activities, consulting	.
Public administration	
Other services	.
FISIM	
Net taxes on products	.
GDP	40**

*** . . . significant at the 99-percent level, ** . . . significant at the 95-percent level, * . . . significant at the 90-percent level.

Public administration

As already mentioned, in the field of public administration (including defence and compulsory social security) value added is calculated directly from the expenditure side. As the large components of these expenditures, such as depreciations and wages and salaries, do not depend on the number of days worked, no working day effect is expected to show up. The analysis confirmed this and, as expected, there was also no Easter effect.

Other services

The category "other services" comprises education (NACE M), health and social services (NACE N), other community, social and personal service activities (NACE O) and activities of households (NACE P). Due to the nature of these activities a working-day effect is imaginable. As for the compilation of the quarterly value-added figures, most of the data refer to the number of employed persons (which are registered at a cut-off date around the middle of the month); thus, in the compilation of the data no information on the number of working days is included[15].

Further components of GDP

The fictitious branches "imputed banking services" (also known as FISIM – financial services indirectly measured) and "net taxes on products" (taxes on products minus subsidies on products) transform gross value added into GDP.

The imputed banking services are regarded as intermediate consumption of all other contributing branches and – for lack of individual ascription of these services – are deducted from gross value added. As this component represents a service covered by the interest margin, a working-day effect can be excluded theoretically.

However, it could be expected that a higher number of working days will increase net taxes on products, as lively economic activity should positively correlate with this component. Indeed, a small but insignificant working-day effect was found. This effect probably stems from manufacturing, where most of these taxes (e.g., fuel and tobacco taxes) are generated.

[15] It has to be borne in mind that the main goal of quarterly national accounts is to track the business cycle and not to exactly depict working-day variations.

Results

The detailed analysis by branches shows a statistically reliable working-day effect only for the manufacturing sector. It amounts to € 56 million per additional working day and is somewhat higher than estimated for GDP as a whole. For two more branches (energy and water supply and wholesale and retail trade) a positive working day effect showed up, which just missed the required confidence level of 95 percent.

The total effect on Austria's economy in 2004, with three working days more than in 2003, cumulates to a mere € 120 million (aggregated approach) or € 170 million (disaggregated by branch), respectively, which is about 0.1 percent of GDP in both cases. In the recent past, the positive effect was largest in the first quarter of 2000 and 2001 (Figure 1), when a 1.25 percent rise in working days caused an additional production of 0.1 percent in both quarters. The largest effect since the first quarter of 1988 was recorded in the first quarter of 1997: the loss of 2.25 working days reduced production by more than 0.2 percent.

Figure 1: Working-day effect

As a percentage of unadjusted quarterly real GDP

Working-day effect in Germany considerably higher

Compared with the working-day effect calculated by the German Bundesbank of 0.6 percent for 4 additional working days[16], the effect in Austria with 0.1 percent seems to be rather low. Calculated with four additional working days, Austria's GDP would rise by no more than a modest 0.11 percent[17].

For this discrepancy, several reasons can be enumerated. The German Bundesbank also applies a method which is based on data by sectors, but these estimates are derived independently from seasonality (*Kirchner,* 1999). As such results may fail to be consistent, the Austrian method seems to be superior in this respect. By contrast, the German method applies calendars specifically suitable for the various branches, which is not the case in the Austrian approach. As already mentioned the method used by *Flaig* (2000) applied to 3 more working days as is the case in Austria in 2004, yields a working-day effect of 0.5 percent of real GDP.

Quarterly data are not suitable for analysing the working-day effect, because the weight of additional working days on a quarterly basis is substantially lower than on a monthly basis (*Cleveland – Delvin,* 1982). The divergence in the results for the monthly and quarterly series of overnight stays in the Austrian case made this apparent. Unfortunately, monthly GDP figures are not available. GDP is measured on a quarterly basis in order to capture business cycle movements more precisely;

[16] The calculation of working and holidays for Germany is difficult, as some holidays (6 January, Corpus Christi, 1 November and Prayer days) exist only in some regions.

[17] According to the OECD Step meeting by the end of October 2003, France presented an estimated working-day effect of 0.2 percent to 0.3 percent of GDP in 2004 for its economy.

components of higher frequency are not intended to be represented as they can render business cycle detection more difficult.

A further reason for the difference in the size of the working-day effect between Germany and Austria refers to the differences in the raw data used for setting up quarterly national accounts. Whereas in Austria employment data form the backbone of the calculation in large parts of the service sector on a sub-annual basis, in Germany data are also available on the volume of working time for this sector[18]. In contrast to employment data, this indicator reflects variations in working days, which subsequently show up in value added.

Conclusion

The effect of a variation in working days on real GDP in Austria can be computed only for manufacturing with the required statistical reliability, given the actual data basis. In all other branches, this effect does either not exist or is not statistically significant. There are several reasons for this. The consequences of a variation in the number of working days for production are not reflected sufficiently in the data base (because in most cases the underlying data do not contain such an effect), in other cases the aggregation level (quarters) is too high, the calendars not sufficiently differentiated or the number of observations too small.

According to an econometric time series model three additional working days in 2004 (compared to 2003) raise production by € 120 or 170 million, depending on the approach used (total GDP or GDP components). This corresponds to approximately 0.1 percent of real GDP. Considerably larger effects have been computed for Germany; the difference between the effect in Germany and Austria can also be attributed to methodological differences regarding the estimation of the working-day effect and the generation of the data.

Nearly all methods used for estimating working-day effects assume constant parameters and orthogonality of time series components[19]. This implies that the working-day effect is assumed not to rise or fall over time and also that it does not interact with other components of the series like trend-cycle, season or other factors. In reality, however, it seems evident that the working-day effect is subject to changes over time. The introduction of new innovative working-time models as well as new production technologies may reduce the effect of variation in working days on production.

It is also plausible that this effect is not independent of the prevailing position in the business cycle. In times of weak total demand – when some branches reduce the number of hours worked or hoard labour – an additional working day is expected to have a substantially smaller effect than in times of full capacity utilisation.

Therefore, the size of the effect presented in this paper has to be regarded as an average value, which can deviate positively or negatively according to the economy's position in the business cycle. For the same reason, an abolition of a holiday in times of weak economic performance may trigger a smaller production increase than in times of full capacity utilisation.

The economic-policy question as to the effect of an abolition of one working day can not be answered with the approach used in this paper. Nor is this method appropriate for estimating the effects of strikes. In both cases, the finding that there is no significant working-day effect does not allow conclusions as to the effects of such measures. Conversely, the existence of a working-day effect in a special branch says nothing about the effects of such permanent measures.

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[19] This is also the case for the German and Austrian approach.

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The Working-Day Effect in the Austrian Economy – Summary

In 2004, there will be three working days more in Austria than in 2003, due to the leap year and the particular situation of holidays in the calendar. An analysis of quarterly GDP data using a seasonal time series model suggests, that three additional working days will boost annual output by 0.1 percent.

The assessment of the current business situation requires an adjustment of economic data for seasonal factors and the changing number of working days. The simplest method of calculating the working-days effect, namely dividing output by the number of working days, is not the adequate approach, since it attributes the same weight to each working day and, moreover, does not examine whether the varying number of working days is of relevance at all for the level of output.

Using a seasonal time series model, WIFO has estimated the seasonal and the working days component in a consistent way. These estimates have been carried out for overall quarterly GDP as well as for its sectoral components. For the more detailed approach, a total effect of around € 56 million per additional working day was derived, for aggregate GDP an amount of € 40 million. Thus, the impact of the three additional working days in 2004 would in both cases be some 0.1 percent of annual GDP. In recent periods, the positive effect was greatest in the first quarters of 2000 and 2001, when the number of working days was 1.22 above the average, raising quarterly GDP by about 0.1 percent, respectively.

However, this result should be interpreted with caution, since the underlying approach assumes the working-days effect to be independent from the cyclical component. The effect obtained is an average of values that can vary in positive and negative direction, depending on the phase of the business cycle.

The method used differs from the one applied by the Deutsche Bundesbank in calculating the working-days effect for Germany. The latter yields an output increase of 0.6 percent of GDP for the four additional working days occurring in 2004.

In general, quarterly GDP forms a weak base for calculating a working-days effect, since its calculation is designed for the monitoring of the business cycle and a proper identification can only be done on a monthly basis. Moreover, the quarterly national accounts are established in some instances upon sectoral data which themselves do not include a working-days effect.

The working-days effect obtained does not allow straightforward conclusions on the potential impact of changing a public holiday into a working day or of a day's strike. Thus, even in sectors for which no working-day effect can be identified, e.g., because of shift work on weekends, a strike day may well reduce output and vice versa.