1. Research motivation and overview

The dating of business cycle turning points is still an important basis for economic policy decisions. Turning points mark the point of time at which booms end and recessions are overcome. Hence, they provide important information for initiating and terminating counter-cyclical policy action. Fiscal policy interventions suffer from recognition, legislation and execution time lags and also monetary actions take time to work their way through the economy. In order to reap the benefits of stabilisation policy[1], it is necessary to forecast turning points or at least to identify them timely. For both tasks, investigation into the history of turning points – with an exact dating scheme – is crucial, as it can serve as a benchmark for setting up real time based models.

Regular revisions of the economic data set, changes in methodology for measuring total economic output (like the introduction of the ESA regulation for European countries), the adoption of new statistical methods for price adjustments and further innovations make a regular update of business cycle analysis necessary also for past periods. Furthermore, economic research frequently brings forth new sophisticated methods for business cycle analysis, often supported by enhanced computational possibilities.

Despite the fact that business cycle variations are mostly understood to be a demand-based phenomenon there is merit in studying them also on a sectoral basis. According to the classical definition of the business cycle by *Burns – Mitchell* (1946), business cycles are a type of fluctuation found in aggregate economic activity. This does not necessarily mean that the object of observation has

[1] Examples for recent estimations of the costs of business cycle fluctuations are *Reis* (2005) and *Dellas* (2003). *Barlevy* (2004) gives a good overview about methods and empirical results.

to be an indicator of aggregate economic activity like GDP[2]. A comovement of such fluctuations in other economic time series – whether interrelated or not – would also fulfil this criterion.

Long – Plosser (1983) stressed the comovements of sectoral output fluctuations as being one of the important features of business cycles. *Hornstein* (2000) found, that these sectoral links show up in several time series like gross output, value added and materials and energy use. *Rebelo* (2005) supplied evidence for the strong correlation between hours employed by industry and total hours employed by the private sector. This strong comovement in economic time series like sectoral output[3] probably induced *Lucas* (1977) to argue that business cycles were driven by aggregate shocks and not by sector-specific ones.

Despite the widely accepted view of the existence of only one business cycle driven by aggregated shocks, these variations can show up in sectoral time series with different amplitudes and with some lagging or leading characteristics. Indeed, the prominent NBER approach for detecting business cycles is based on sorting the different time series by their leading and lagging properties.

Beside the view that supports the existence of only one business cycle, studies based on band pass filters and spectral analysis methods reveal several cycles, all of which represent frequencies qualifying them for being business cycles. Apart from this, there are also statistical reasons for observing business cycle movements at the detailed sectoral level. It is quite easy to understand that if a

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[2] In fact, most studies on business cycles concentrate on GDP or industrial production as reference series.

[3] The European System of National Accounts uses the term "sectors" only for subdividing the economy by the sectors "government", "private households", "enterprises" and the "external sector". Nevertheless, the English literature uses the term sector for different branches which is followed in the underlying study, too. In the terminology of the European System of National Accounts these are described as "kind of activities".

small open economy gets export impulses from different economic areas (e.g. the US and Europe) these can show up in different economic sectors and interfere with domestic, idiosyncratic cycles[4] [5]. Confounding both cycles by aggregating the underlying time series to a higher total (like the GDP) could hamper a proper identification of the business cycle and therefore give rise to misleading conclusions about timing and size of fluctuations, and thereby to suboptimal or even wrong economic policy reactions.

Observing business cycles at the sectoral level has the great advantage that it sheds light on economic transmission mechanisms, whereas for stabilisation policy purposes its benefits are not so clear. This is based on the notion that the business cycle is mainly driven by fluctuations in demand that can be smoothed by interventions targeting certain demand components[6]. Opposite to this, supply side measures are understood to aim at the trend component only. Therefore classical stabilisation policy i.e. fiscal and monetary policy intends to act on output via demand aggregates, but not on the long-run growth (trend) path. This view has somewhat changed today in that economic policy tries to generate demand by directly targeting the long term growth path[7]. Examples for this are investment premia, public spending for education or subsidies for research and development. Looking at sectoral cycles, apart from giving an insight into transmission mecha-

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[4] An example can be the international business cycle interfering with a political one of the type mentioned by *Nordhaus* (1975).

[5] The idea of the existence of several independent driving forces has been taken up methodologically by the dynamic common component modelling approach, where several common cyclical factors represent the business cycle.

[6] Prominent exceptions to this are Real Business Cycle models, brought forward by *Kydland – Prescott* (1982). *Blanchard – Quah* (1989) criticise this as lumping together supply and demand shocks whereas only the latter refer to what economists usually regard as business cycles. For a good overview about the actual development and the future relevance of the Real Business Cycle theory see *Rebelo* (2005).

[7] For the Austrian case see e.g. *Aiginger* (2005).

nisms, could guide economic policy by suggesting branch-specific measures, although these could be difficult to implement.

The present study intends not only to date the Austrian business cycle, but also to give information about the leading and lagging properties for several economic branches. Furthermore, their interrelation with corresponding sectors for Germany and to the euro area as a whole will be analysed. This may give insight into the transmission mechanisms from the international business cycle to the Austrian economy. In order to check the robustness of results, several procedures for isolating and analysing the business cycle will be applied that have become popular in recent time. Additionally, the results of dating the Austrian business cycle are compared with earlier studies[8]. Several contributions have recently been published which focus on the correlation between business cycles in different countries, but there is a lack of recent studies for Austria[9] due to its small economic weight. Such analysis has been carried out for GDP as a whole[10] or for industrial production only, but not for different Austrian branches[11].

The focus of this study is on detecting business cycle comovements between countries on a branch level and dating the respective turning points. A timely identification of turning points at

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[8] *Breuss* (1984) and *Hahn – Walterskirchen* (1992) carried out the last thorough investigations of business cycles for Austria. *Brandner – Neusser* (1992) and *Cheung – Westermann* (1999) investigated into the impact of the German business cycle on the Austrian industrial production.

[9] Exceptions are the rather new studies of *Vijselaar – Albers* (2001) and *Artis – Krolzig – Toro* (2004) where only industrial production is used for determining the Austrian business cycle.

[10] According to *Harding – Pagan* (2002), the use of many series in the approach of *Burns – Mitchell* (1946) in order to gain a synthetic indicator of the business cycle only indicates, that ". . . these were surrogates for a single series, GDP, as that was unavailable to them".

[11] *Rünstler* (1994) is an example for a sectoral study of the Austrian economy, but focuses more on the long-run impact of foreign shocks.

the margin is not the aim of this study, however. This would require the use of business survey data with leading properties and either detrending methods based on non-symmetrical filters or series forecasts based on real-time data in order to circumvent the end-point problem of symmetrical filters. Furthermore, variables which can explain shocks to business cycle variations (for instance oil price and exchange rate variations) are not considered explicitly, as they are assumed to affect all countries observed in the same direction[12] or they feed into the business cycle in the end.

Diagram 1 gives an overview over the typical methodological steps to be taken in business cycle analysis. It presents a stylised flow of several procedures. However, this does not mean that these steps have to be followed consecutively, as some methods cover several of them at the same time. Following this sequence, the underlying study is organised accordingly. The first chapter presents the data and the procedures applied to prepare them for this study. The second deals with the various methods for extracting the business cycle frequencies from the underlying data. Related to this, a literature survey of the various methods with an examination of their theoretical properties and empirical problems is provided. As different methods can produce substantially different results, not one single is chosen for this study but three different ones. In the next chapter several approaches for the identification of the business cycle from the transformed data are presented. Again, different methods are applied in order to check the robustness of results. The fourth chapter addresses the problem of dating and analysing the business cycle for Austria. In the following chapter, the findings on dating, together with some stylised facts, are compared with the results from other studies. The last chapter offers the conclusions.

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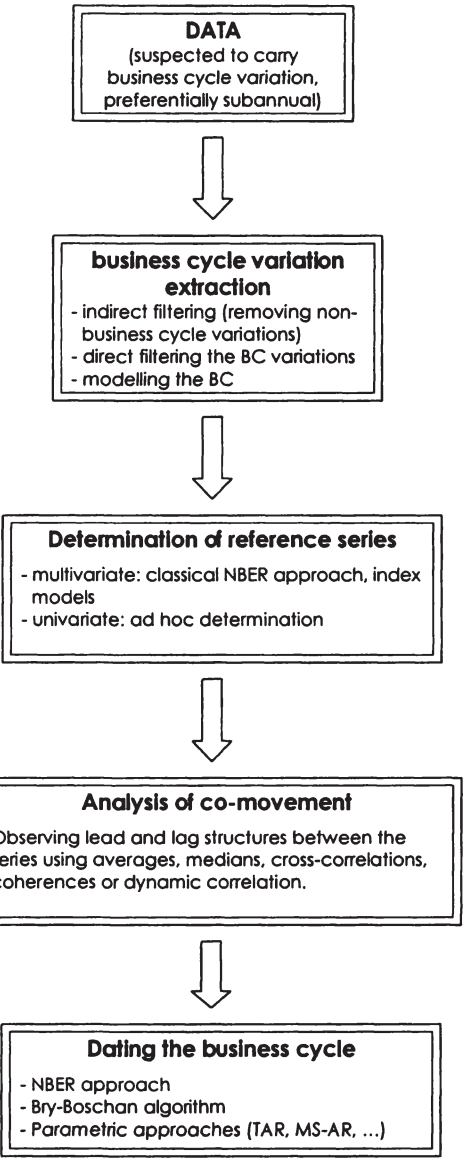
[12] This assumption seems to be justified if the economies considered have similar structures, as it is plausible to assume.

Figure 1: Steps of business cycle analysis



Source: Own illustration.