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The Location of Globalisation

Abstract

This paper applies a measure of integration suggested by Vinals and Jimeno (1996) to quarterly Austrian unemployment data. It shows that this measure can be derived from a stylized regional labor market model. We present evidence that a) dependence on international developments in unemployment rates has increased in the 1980's and 1990's b) This increase is felt most strongly at the one year ahead forecast interval c) There is no clear cut evidence whether increased integration has primarily affected regional or national components of unemployment. d) Changes in the measure of globalisation are more significant, as more European countries are included. When the United States are included, however, significance vanishes e) Integration is more strongly felt in industrial regions and regions near to the border.

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1 Introduction

One of the views expressed repeatedly in the globalization debate is, that regional economic developments are becoming increasingly dependent on international developments. Related to this national and regional policy makers argue, that their influence over regional development has been reduced in the face of globalization. Unemployment is one of the key variables, where globalization, and the suspected loss of control of the nation state, as well as regions, over interior developments has raised considerable concern. Recently, this has also been acknowledged by the European Union by increasingly moving labor market policy from the national to the European level.

There are also good reasons to believe this increased dependence has affected regions in different ways. The channels through which international developments influence the regional economy such as openness to foreign trade, foreign direct investments and migration show considerable regional variation, which contributes to a regionally differentiated impact of globalization. Furthermore, geographical factors such as distance to the border or proximity to European centers may be of importance in determining, how strongly a region depends on developments abroad.

Despite the fear of loss of control among policy makers, and the widespread belief in regionally differentiated outcomes of globalization, there is to date very little direct evidence on the interaction of unemployment rates across borders and few empirical investigations have attempted to measure the results of the globalization process on regional labor markets directly. This paper aims to partially fill this gap, by applying a simple Vector Autoregression (VAR) Model to a regional data set of Austria, with the goal of addressing three issues: First, do international developments in the unemployment rate really influence regional unemployment more strongly today than about 20 years ago? Second, was the regional or national share of unemployment variations reduced in this time period? Third, in which regions is the dependence on international developments felt most strongly?

To do this we use a data set encompassing quarterly time series of unemployment rates reaching from 1961 to 1998 for 9 Austrian provinces. We split this data into two subsamples (1960-1978 and 1979-1997). We also use annual time series of aggregates of 8 Austrian functional region types reaching from 1986 to 1997. We measure international changes in unemployment rates by an aggregate unemployment rate of the neighboring countries of Austria and some selected OECD countries from the same time period.

In our analysis we present a number of stylized facts, which support the hypothesis that globalization has indeed increased the dependence of regional unemployment rates on international developments. We find a number of further "stylized facts": First, significant increases in dependence on international factors are found mainly with the one year ahead prediction error. Second, the increased dependence on the international factor becomes more significant if other European countries are included in the proxy for international developments, but loses significance if the United States are included. Third, no clear picture emerges, when we analyze, whether the increase in international dependence has been at the expense of regional or national factors. Our results suggest considerable latitude in explanations but slightly prefer national factors Fourth, industrial districts are most dependent on international factors. Finally, although our main interest is with empirical issues, we are able to show that the statistical model proposed in this paper can be derived from a simple labor market model which highlights trade as a major source of international interaction.

The paper is organized as follows: The next section presents a short overview of the methods that have been applied so far to isolate international factors in business cycles, and describes the method we apply in this paper. We argue that one of the drawbacks to these methods is their lack of a clear connection to theory. For this reason we show in section three, that a simple model of the interaction of labor markets, which focuses on trade among regions of potentially different sizes, generates models of a similar structure as the empirical models of the literature. Section four presents the data set and some stylized facts concerning labor market interaction across borders

Section five discusses specification issues. Section six presents results and section seven concludes the paper.

2 Previous Work

A number of other authors have attempted to measure the role of international factors in driving the business cycle. A key issue in this literature is the identification and measurement of the "international factor", and relatedly the way in which this "international factor" is modelled. In a recent survey Clark and Shin (1998) mention a number distinct identification and measurement strategies: Some authors coming from regional analysis (Blanchard and Katz, 1992 and Decressin and Fatas, 1995) run regressions of regional variables on national aggregates and interpret the resulting R^2 as a measure of the importance of aggregate forces. Regression techniques have also been used by Stockmann (1988) and others, who include regional and time specific dummy variables into income growth regressions, in order to test the significance of industrial and regional factors. Others (Altonji and Ham, 1990) in the tradition of the "stylized business cycle facts" literature use cross-correlations of (detrended) series to measure the co-movement of regional, national and international series. Recently Knetter and Slaughter (1999) have proposed measures of economic integration based on cross border trade flows.

In the more formal framework of factor models (Norrbin and Schlagenauf (1996) and Forni and Reichlin (1997)) the variables of interest is are the residuals of a Vector Autoregression (VAR) including regional (r) and sectoral (s) variables. It is assumed that these residuals (e_{srt}) are a weighted sum of mutually uncorrelated region specific (e_{rt}), international (e_t), sectoral (e_{st}) and idiosyncratic (v_{srt}) components. Thus the residuals of a vector autoregression are postulated to be of the following form:

$$e_{r;i;t} = \delta_{r;s} e_t + \theta_{r;s} e_{rt} + \gamma_{r;s} e_{st} + v_{srt}$$

While this approach has the advantage that through the "systematic" part of the VAR all shocks are propagated across all regions and sectors, it has to assume that the common shock (e_t) is the same across all regions. An increase in the share of the total variance explained by the common shock thus can not be interpreted in terms of developments outside a region influencing its internal developments more strongly, but as an increased importance of an abstract common factor which hits all regions simultaneously.

In order to address the issue of increased dependence upon outside developments, we follow a method suggested Vinals and Jimeno (1996).[1] This consists of estimating a trivariate VAR including European Union, national and regional unemployment rate series: Assuming a one-way interaction between the European unemployment rate u_t^{EU}, the national aggregate unemployment rate u_t^N and the regional unemployment rate u_t^R, this empirical model can be postulated as:

$$
\begin{aligned}
u_t^{EU} &= A_1(L)u_{t-1}^{EU} + \varepsilon_t^{EU} \\
u_t^{N} &= B_1(L)u_{t-1}^{EU} + B_2(L)u_{t-1}^{N} + \varepsilon_t^{N} \\
u_t^{N} &= C_1(L)u_{t-1}^{EU} + C_2(L)u_{t-1}^{N} + C_3(L)u_{t-1}^{R} + \varepsilon_t^{R}
\end{aligned}
\qquad (1)
$$

where the $A_k(L)$, $B_k(L)$ and $C_k(L)$ with $k \in \{1;2;3\}$ are lag polynomials, the ε_t^i with $i \in \{EU;N;R\}$ are serially uncorrelated shocks (that is $Cov(\varepsilon_t^i;\varepsilon_{t-j}^i) = 0$ for all $j > 0$), u_t^i are the unemployment rates of the EU, a nation and a region respectively and t is the index for the time period. Furthermore, it is assumed that the shocks are orthogonal i.e. $Cov(\varepsilon_t^i;\varepsilon_t^l) = 0$ for all $i \neq l$.[2] Vinals and Jimeno (1996) also argue that an alternative to this model would be:

$$
\begin{aligned}
u_t^{EU} &= A_1(L)u_{t-1}^{EU} + A_2(L)u_{t-1}^{N} + A_3(L)u_{t-1}^{R} + \varepsilon_t^{EU} \\
u_t^{N} &= B_1(L)u_{t-1}^{EU} + B_2(L)u_{t-1}^{N} + B_3(L)u_{t-1}^{R} + \varepsilon_t^{N} \\
u_t^{R} &= C_1(L)u_{t-1}^{EU} + C_2(L)u_{t-1}^{N} + C_3(L)u_{t-1}^{R} + \varepsilon_t^{R}
\end{aligned}
\qquad (B)
$$

[1] see also: Watzdorf and Wörgötter, 1990 and Huber and Wörgötter, 1999

[2] Jimeno (1992) shows that under a number of assumptions models of this structure are equivalent to factor models.

with the same assumptions on the shock structure. Models (A) and (B) are both vector autoregressive processes, which can be consistently estimated by standard least squares methods under the assumption that the u_t^i are stationary (see: Lütkepohl, 1993). The estimated model can be inverted into its Moving Average representation:

$$u_t = \sum_{j=0}^{\infty} \Theta_j \varepsilon_{t-j}$$

with u_t the column vector of the u_t^i, ε_t a series of white noise errors terms and the Θ_i a series of 3x3 coefficient matrices. Denoting the $\theta_{ik,j}$ the element of Θ_j in column i and row k, the mean squared n-step ahead prediction error $(E(\hat{u}_{t+h}^i - u_{t+h}^i))$ of the forecast unemployment rate $(\hat{u}_{t+h}^i)$ for the i'th equation (under the assumptions on the error term) can be written as:

$$E(\hat{u}_{t+h}^i - u_{t+h}^i) = \sum_{k \in \{EU, N, R\}} (\theta_{ik,0}^2 + \dots + \theta_{ik,h-1}^2)$$

and the share of the h-step ahead prediction error due to variable j in equation l can be calculated as:

$$\omega_{ij,h} = \frac{\sum_{j=0}^{h-1} \theta_{ik,j}^2}{\sum_{k \in \{EU, N, R\}} (\theta_{ik,0}^2 + \dots + \theta_{ik,h-1}^2)}$$

Thus VARs deliver an intuitive measure of dependence of regional unemployment levels on factors outside the own territory: In the context of this paper the share of the prediction error in the third equation of both models due to the European shock is a natural measure of "dependence on international factors". This measure provides an interpretation to globalization in the sense of answering to the question of "how much in the variance of the forecast is due to unexpected innovations in the European unemployment level"? Furthermore, it makes clear that "international factors" can be of different importance at different forecast horizons. It could be that in the short run (say over a quarter) international developments are of lesser importance for a regional labor market, but that as foreign shocks filter through the system, they determine more and more of the volatility of unemployment rates. This draws attention to the fact that the influence on international factors may not only depend on the size of the shock but also on the propagation mechanisms within countries.

3 A model

Vinals and Jimeno (1996) state, that the simple structure of the model makes it difficult to give a clear interpretation to the meaning of the term "international shocks". To motivate the Vector Autoregression approach more rigidly, we develop a simple three region labor market model.[3] In this model we highlight the role of interregional linkages in labor demand and transmitted though trade (or potentially capital mobility), while we place less stress interactions of labor supply across regions. The reason for this is, that European migration rates are low, which leads us conclude that the empirical relevance of crossborder migration in transmitting international shocks is small.

There are three regions in the model. Each of them is indexed analogously to the last section by $i \in \{R; N; EU\}$ (R for region, N for nation and EU for abroad respectively), however, we now define N to stand for the unemployment rate in the nation "excluding" the region (R), (i.e. the rest of the country) and EU as "the rest of the world". All regions produce a single product, which requires only labor as an input. Product markets are perfectly competitive, the equilibrium level of profits is zero and prices of the output are normalized to unity. Thus labor is the only source of income. Regions are characterized by a labor demand schedule[4] :

$$n^i_t - u^i_t = -d^i(w^i_t) + z^i_t + \varepsilon^i_{Dt} \tag{2}$$

where n^i_t is the logarithm of labor supply u^i_t is unemployment rate $n^i_t - u^i_t$ is the logarithm of employment w^i_t are log wages, $-d^i$ is the elasticity of labor demand with respect to wages, which may differ in between regions and z^i_t as well as ε^i_{Dt} are a deterministic and a stochastic shift term to labor demand.

[3] A similar model has been proposed by Blanchard and Katz, 1992 to analyze regional adjustments

[4] In defining the left hand side of this demand schedule we use the fact that the log of the unemployment rate defined as a share of the employed is can be approximented by $u \approx n - e$

Labor markets, however, do not clear. The reason for this may be either unions setting wages above market clearing levels, or efficiency wage considerations prompting employers not to lower wages sufficiently to reduce unemployment. The simplest way to capture either of these motives in a stylized model, is to assume that the wage level depends on unemployment (see Bean, 1994). Thus we postulate a wage setting equation:

$$w_t^i = -h^i u_t^i \tag{3}$$

with h^i a region specific coefficient which measures the extent of insider power (the smaller h^i the higher is insider power). Finally, labor supply depends both on the chance of a person to obtain work when offering it, which can be proxied by the unemployment rate, and the wage rate.

$$n_t^i = b^i w_t^i - g^i u_t^i + \xi_{St}^i \tag{4}$$

with ξ_{St}^i a supply shock b^i the elasticity of labor supply to wages and g^i the semi elasticity of labor supply with respect to unemployment. Substituting equation (3) and equation (4) into (2) and rearranging gives the unemployment rate of a region i in dependence of the location of the labor demand schedule:

$$u_t^i = \Omega^i(z_t^i + \xi_{Dt}^i - \xi_{St}^i) \tag{5}$$

with $\Omega^i = \frac{-1}{1+(b^i+d^i)h^i+g^i}$. Since $\Omega^i < 0$ this means that positive shifts in labor demand and negative shifts in the labor supply reduce unemployment.

Since labor is the only source of income in the model the logarithm of income in region i at time t (y_t^i) is given by:

$$y_t^i = w_t^i + n_t^i - u_t^i$$

which when substituting equation (3) and equation (4) may be written as $y_t^i = -\alpha^i u_t^i + \xi_{St}^i$

with $\alpha^i = (h^i + 1 + b^i h^i + g^i) = \frac{-1}{\beta^i} + (1 - d^i)h^i$. Thus since wages are the only source of income in this economy low unemployment rates imply higher income.

In our model regions are linked through the interaction of demand. There are two options for introducing such linkages. In the first case, which we refer to as the "small region" case, we assume for region EU demand from both R and N is so small, that demand changes are unnoticeable in this region. This implies that for region EU:

$$z_t^{EU} = y_t^{EU} \tag{6}$$

For region N only its own demand and demand from region EU is relevant, while the demand from R is to small to matter for developments in N. Thus:

$$z_t^N = y_t^n + \lambda_1^N y_t^{EU} \tag{7}$$

with λ_1^N a parameter, which measures the strength of the demand linkage between N and EU For region R finally all the demand from all other regions is relevant implying that defining λ_1^R and λ_2^R as parameters:

$$z_t^R = y_t^R + \lambda_1^R z_t^{EU} + \lambda_2^R y_t^{EU} \tag{8}$$

An alternative, more parsimonious, assumption to this would be to assume that the demand situation of each region influences that of the other - a case we term the "large region" case[5]. If we assume that contemporaneously (over a quarter) the smaller region has no impact on the larger region, which seems plausible, if one considers the size differences between a province, Austria and the rest of the world. This "large region" case can be formally represented as:

$$z_t^{EU} = \gamma_o^{EU} y_t^{EU} + \gamma_1^{EU} y_{t-1}^N + \gamma_2^{EU} y_{t-1}^R \tag{5'}$$

[5] Mixtures of these two cases can of course be allowed as well. These, however, are not developed in this paper.

$$z_t^N = \gamma_o^N y_t^{EU} + \gamma_1^N y_t^N + \gamma_2^N y_{t-1}^R \tag{6'}$$

$$z_t^R = \gamma_0^R y_t^{EU} + \gamma_1^R y_t^N + \gamma_2^R y_t^R \tag{7'}$$

with γ_k^i a set of parameters to measure strengths of linkages as λ_k^i above. Developing the small region model given in (5) to (8) further gives the following system of equations which clearly bears a close resemblance to the model of Vinals and Jimeno (1996) above[6]:

$$u_t^{EU} = \frac{-\beta^{EU}}{1+\alpha^{EU}\beta^{EU}}\left[\xi_{Dt}^{EU}\right]$$

$$u_t^N = \frac{-\beta^N}{1+\beta^N\alpha^N}\left[\lambda_1^N\alpha^{EU}u_t^{EU} - \xi_{Dt}^N\right]$$

$$u_t^R = \frac{-\beta^n}{(1+\beta^n\alpha^n)}(\lambda_1^R\alpha^{EU}u_t^{EU} + \lambda_2^R\alpha^N u_t^N - \xi_{Dt}^R)$$

The "large region" case can be developed from equations (5) and (5') to (7') into:

$$u_t^{EU} = \frac{-\beta^{EU}}{1+\beta^{EU}\gamma_0^{EU}\alpha^{EU}}(\gamma_1^{EU}\alpha^N u_{t-1}^N + \gamma_2^{EU}\alpha^R u_{t-1}^R - \eta_t^{EU}) \tag{8'}$$

$$u_t^n = \frac{-\beta^N}{1+\beta^N\gamma_0^N\alpha^N}(\gamma_0^N\alpha^{EU}u_t^{EU} + \gamma_2^N\alpha^R u_{t-1}^R - \eta_t^N) \tag{9'}$$

$$u_t^R = \frac{-\beta^R}{1+\beta^R\gamma_0^R\alpha^R}(\gamma_0^R\alpha^{EU}u_t^{EU} + \gamma_1^R\alpha^N u_t^N - \eta_t^N) \tag{10'}$$

with $\eta_t^i = \xi_{Dt}^i - \gamma_k^i\xi_{St}^i$. The two models are thus theoretical equivalents of the empirical models presented in (A) and (B). Three points are worth mentioning:

1. The difference between the two models is whether the influences of demand conditions of smaller regions on larger regions are deemed important. Thus a rejection of model B vis a vis

[6] indeed if we allow $\xi_{Dt}^i = \Theta^i(L)\varepsilon^i$ to be autocorrelated one derive the Moving Average representation of the model estimated in Vinals and Jimeno (1996) exactly

model A would suggest that the importance of smaller regions in determining unemployment developments in larger regions is negligeable.

2. The model draws attention to the fact that dependence on the international factor depends not only on the size of the parameter γ_0^{EU}, which measures the strength of demand linkages, but also on the changes in the "propagation mechanism" through which international shocks operate, which is captured in the parameters summarized in β^R and α^R. Rewriting Equation (10')[7] we get $u_t^R = \frac{\gamma_0^R \alpha^{EU} u_t^{EU} + \gamma_1^R \alpha^N u_t^N - \varepsilon_t^N}{(1-\gamma_2^R)[1+(b^R+d^R)h^R+g^R] - \gamma_0^R(d^R-1)h^R}$ taking the derivative $\frac{\partial u_t^R}{\partial u_t^{EU}} = \frac{\gamma_0^R \alpha^{EU}}{(1-\gamma_2^R)[1+(b^R+d^R)h^R+g^R] - \gamma_2^R(d^R-1)h^R}$ gives the contemporaneous effect of a change in u_t^{EU} on u_t^R which is decreasing in b^R; d^R and g^R as well as in h^R if $\gamma_2^R < \frac{1+b^R}{d^R+b^R}$. Thus a rise in integration can be brought about by a fall in the wage elasticity of demand (d^R), a falling reaction of labor supply to unemployment (g^R) or a reduction in the wage elasticity of labor supply (b^R). The intuition behind this result is that the less reaction to shocks is cussioned by wages the more strong will be changes in unemployment as a consequence of any shock international or other.

3. While it is true that in the model the shocks are difficult to interpret structurally, either as demand or supply shocks, shocks are separable by countries. This implies that the identified shocks may be interpreted as a weighted sum of demand and supply shocks in a region.

4 The Data

The data we use includes quarterly registered unemployment rates from the 9 Austrian provinces from 1961 - 1997. Figure 1 in its top panel displays the evolution of the logarithm of average annual relative unemployment rates[8] across the nine provinces for the observation period. There has been a clear convergence of unemployment rates among the Austrian regions, which has been

[7] Note that $\alpha^i = \frac{-1}{\beta_i} + (1-d^i)h^i$

[8] ie it displays the variable $x = \log(u_i) - \log(u)$ with u_i and u the regional and national unemployment rates respectively.

determined by the development of the extreme regions: Vienna and Vorarlberg, which were at the extreme lower end of unemployment rates in the 1960's, showed a substantial increase. The Burgenland, as a high unemployment region in the 1960's, in contrast exhibited a clear downward trend. Despite the substantial decline in regional unemployment rate disparities, hierarchies among regions have remained quite stable. The rank correlation of the average unemployment rates from 1965-75 and 85-95 on a county level is significant at a 1% level.

Furthermore we use annual unemployment rates from 82 Austrian labor market districts reaching from 1986 to 1997. Figure 2 repeats Figure 1 for district level data and shows that at least in the last 10 years the clear tendency towards convergence among Austrian provinces has not carried through to the district level.[9] The coefficient of variation among the 82 Austrian districts has remained relatively stable throughout and so has the hierarchy among regions (The coefficient of correlation of relative log unemployment rates between 1986 and 1997 is significant at the 1% level.)

As a proxy for international developments, our data set includes all countries, which report quarterly unemployment and employment in the OECD main economic indicators database since 1960. These are Italy, Germany, Belgium, Finland the U.K. and the United States. Since the data is in levels, we can derive an aggregate unemployment rate for any subset of these countries We were, however, concerned that this set of countries is highly arbitrary. In consequence we focus on the aggregate unemployment rate of Germany and Italy, since these two countries are both neighbors to Austria and its major two trade partners. We miss only Switzerland among Austrias western neighboring countries. While this may distort regional results slightly, since for both historic and geographic reasons, linkages with Switzerland are particularly relevant in Vorarlberg, it is also clear, that Swiss unemployment was very small relative to that of Germany and Italy throughout 1960 to 1998, so that the additional information would be masked by these two countries

[9] Badinger and Url (1999) show that spatial autocorrelation among regions is relatively high in Austria

	1960-1979*			1980-1998*			R^2**	
	-1	0	1	-1	0	1	60-79	80-98
Vienna	-0.08	-0.11	-0.02	0.08	0.57	0.16	0.001	0.189
Lower Aust.	-0.11	-0.83	0.80	0.05	0.61	-0.03	0.002	0.140
Burgenland	-0.07	-0.06	0.05	0.03	0.60	-0.07	0.002	0.098
Styria	-0.05	-0.03	0.10	0.65	0,49	0.03	0.000	0.121
Carinthia	-0.07	-0.02	0.12	0.07	0.60	-0.05	0.000	0.056
Upper Austr	-0.06	-0.06	0.05	0.06	0.47	-0.02	0.000	0.141
Salzburg	-0.09	-0.05	0.02	0.08	0.58	-0.08	0.003	0.155
Tyrol	-0.04	0.00	0.07	0.10	0.64	0.03	0.001	0.027
Vorarlberg	0.09	0.04	-0.04	0.26	0.54	-0.15	0.008	0.191

* series were detrended by a Hodrick Prescott filter. The reference is the unemployment rate of neighboring countries -1 signifies a lag of one, 0 contemporaneous correlations, 1 a lead of one; ** R^2 values of a regressions of the form $\Delta_4 u_t^{EU} = a + b\Delta_4 u_t^{R}$

—Table 1: Cross-Autocorrelations of Regional Unemployment Rates with Neighboring Countries and R 2 Values of Regression Analysis

Using this data set, we are interested in testing two hypotheses First, has globalization really led to an increase in the dependence on foreign unemployment rates? Second, was this increase at the expense of regional or national factors. To address these two issues we split our data set on Austrian provinces into two separate time periods The first time period reaches from the first quarter of 1961 to the fourth quarter 1979 the second from the first quarter 1980 to the fourth quarter 1998. The reason for choosing the cutoff date 1980 is that it provides for equally long observation periods before and after the cutoff point.

A number of stylized facts lead us to the believe that interdependence between regional unemployment rates and foreign unemployment rates has indeed increased. First, we run regressions of the fourth difference of quarterly regional unemployment rates on the fourth differences of both the unemployment rates of neighboring countries for both subperiods. As proposed by Blanchard and Katz (1992) we interpret the resulting R^2 values as a measure of globalization. Table 1 in its last two columns shows the results of this experiment. For all Austrian provinces we find substantial increases in this R^2 value. In the period from 1961 to 1979 the R^2 values for our regressions lie between 0.000 for and 0.008. In the 1980 - 1998 period the range of this parameter is between 0.027 and 0.191.

Table 1 following Altonji and Ham (1990) also reports cross correlations of detrended (by means of an Hodrick-Prescott Filter) regional unemployment rates and detrended unemployment rates of neighboring countries. In the period 1960 to 1978 the contemporaneous correlation of detrended regional unemployment rates in Austrian provinces with those of neighboring countries was in general negative and insignificant. In the period from 1979 to 1997 correlation coefficients by contrast were positive and significant.

5 Specification Issues

Before estimating the model we apply a number of univariate tests for the presence of stochastic and deterministic trends in unemployment rates of all regions (these are Dickey-Fuller and stock Watson tests as well as the t-statistic for a linear and a squared deterministic trend). When levels data is used the null of a unit root cannot be rejected for any of the series involved, but can be rejected for all series at the 10% level and for the vast majority at the 5% level for data in first differences. This suggests that estimation should proceed in first differences.[10] In a next step we estimated both models (A) and (B) and checked, by means of F-Tests, which model should be preferred. In around 40% of the cases could we clearly reject Model B in favor of Model A. In all other cases either lagged regional unemployment rates have a significant impact on national rates or national rates on international rates. This together with the fact that F-tests alone are only a weak indication of model specification, since influences of one variable on the other may arise from other equations, leads us to prefer model (B). Finally, to determine the optimal lag structure of the model we use the Hannan and Quinn (1979) criterion for all estimated models. In general the optimal model suggested by this criterion includes 4 to 8 lags.

Furthermore, we use seasonally unadjusted data as has been suggested for this kind of application by Racette and Raynauld (1994) and in more general terms by Abadir, Hadri and Tzavalis (1999). This has a number of reasons, first to the degree that all regions differ in their seasonal

[10] Note that this leaves the theoretical foundation of the model untouched since all of the behavioural equations could equally well have been written in first differences. However, now the error tems are assumed to be in first differences, too.

pattern this has to be interpreted as a "regional" shock. In this instance deseasonalizing the data would underestimate the share of the regional shock, which would bias results in favor of our original hypothesis. Second, and related to this, seasonal filtering, through the application to short time series, may induce a common pattern to the time series, which would also bias result in our direction.

Finally, since we want to formally estimate the hypothesis, that the forecast error share due to different components has changed, a method has to be devised to statistically test for this. Although the asymptotic distribution of the forecast error shares is known (see: Lütkepohl, 1990) our sample is not large enough to warrant trust in asymptotic tests. For this reason we simulate out the distribution of the forecast error shares for each and every model, on the basis of 1000 simulations.[11] Given this distribution we speak of a significant difference of the forecast share at the 5% (10%, 1%) level, if the probability that the estimated forecast error share for the 1980 to 1998 sample is drawn from the distribution of the 1960 - 1979 forecast error share is smaller than 5% (10%, 1% respectively).

6 Results

We organize presentation of results around our three central questions. First, has globalization - as measured by the forecast share of the international shock in the regional unemployment rate - increased? Second, did the changes in the forecast share result in smaller shares for the regions or was the change at the expense of the national share? Third, in which region types is globalization largest?

6.1 Has Globalization increased?

Table 2 reports the estimated share of the international factor in the one quarter, one year and three year ahead forecast error of the regional unemployment rate, respectively. We find increases

[11] We simulate by first generating time series normally distributed shocks then using the MA representation of the estimated model to generate three new series and reestimating the new model. This procedure is repeated a 1000 times. To avoid problems with convergence of the process we use 500 pre-sample observations.

	1. Quarter		1 Year		3 Years	
	60-79	80-98	60-79	80-98	60-79	80-98
Vienna	0.007	0.074*	0.108	0.108	0.109	0.163
Lower A.	0.040	0.136**	0.075	0.184**	0.100	0.254*
Burgenl.	0.025	0.041	0.047	0.064	0.112	0.112
Styria	0.009	0.076**	0.026	0.171**	0.116	0.246*
Carinthia	0.016	0.011	0.036	0.065	0.069	0.042
Upper A.	0.028	0.081	0.060	0.110*	0.150	0.125
Salzburg	0.020	0.033	0.042	0.133**	0.110	0,160
Tyrol	0.000	0.000	0.023	0.115**	0.067	0.140
Vorarlberg	0.000	0.001	0.037	0.094*	0.135	0.106

*** signi…es that the value is larger than the reference value of the same time period at the 1% con…dence level; ** at the 5% level; * at the 10% level. Con…dence levels are based on 1000 simulations of the model

{Table 2: Prediction Error Share Due to the International Factor (Germany and Italy)

in all provinces. These are signi…cant for 6 provinces Interestingly, signi…cant increases are felt in the western provinces of Austria (Upper Austria, Salzburg, Tyrol and Vorarlberg) as well as the industrial provinces (Lower Austria and Styria). Vienna, which as the capital city is characterized by a large share of public sector employment, as well as the least industrialized Provinces of Austria (the Burgenland and Carinthia) show no signi…cant change.

When we move to the one quarter as well as three year ahead prediction error, results become much less signi…cant. Indeed for the three year ahead prediction error, three provinces show declining (although insigni…cant) shares of the prediction error and in the one quarter ahead prediction error a similar behavior is found for Carinthia. Signi…cant increases can only be found in two (respectively three) provinces.

In the one-quarter ahead prediction error seasonality - which is particularly high in Austria - plays a large role. To the extent that seasonality has not decreased, and is interpreted as a region speci…c shock there are few chances for increases in international in‡uences.[12] This is also con…rmed by the low levels of the international factor in tourist (i.e. seasonal) counties such as Tyrol, Carinthia and Salzburg.

To check for the robustness of our results, we formed two more proxy series for international

[12] Indeed our experimentation with annual data for the complete sample show that the forcasrt error shares of tourist regions (Carinthia, Tyrol, Salzburg and to a lesser degree Vorarlberg) - which are also chracterized by strong seasonality are highly sensitive to this change. We …nd shares of the international factor of up to 0.47 (Vorarlberg) if we run Model B for annual data between 1961 and 1997.

	1. Quarter		1 Year		3 Years	
	60-79	80-98	60-79	80-98	60-79	80-98
Vienna	0.027	0.042	0.116	0.070	0.127	0.129
Lower Aust.	0.015	0.080*	0.033	0.098*	0.068	0.216*
Burgenland	0.002	0.034*	0.015	0.047**	0.077	0.124
Styria	0.000	0.045**	0.008	0.140**	0.083	0.215*
Carinthia	0.001	0.004	0.007	0.027*	0.072	0.016
Upper Austr	0.001	0.039**	0.009	0.070**	0.096	0.099
Salzburg	0.005	0.015*	0.029	0.088**	0.103	0.129
Tyrol	0.000	0.002	0.010	0.068***	0.053	0.096
Vorarlberg	0.001	0.029*	0.024	0.075**	0.135	0.101

***signifies that the value is larger than the reference value of the same time period at the 1% confidence level; ** at the 5% level; * at the 10% level. Confidence levels are based on 1000 simulations of the model

{Table 3: Prediction Error Due to the international Factor (European OECD)

developments. In the first we included all European OECD countries available to us (i.e. Germany, Italy, Finland, Belgium and the U.K.) in the second - aside from these countries - the United States were included as well. The results of this experiment (reported in tables 3 and 4) are informative from two further points of view. First, widening the proxy for international factors to include European OECD countries increases the significance of our results. At the 1 year ahead forecast interval significant increases in the forecast error share due to international shocks are significant in all provinces. Also results for the first quarter show increases in all regions and significant increases in seven regions. At the three year forecast interval the results remain insignificant, except for Lower Austria and Styria. Second, taking the experiment one step further and including the United States removes almost all significant results in all but the most industrialized provinces (Styria and Lower Austria). This suggests that much of the increased share of the foreign shock can be attributed to the European integration process in Austria.

A further issue of interest are the levels of integration. According to our results about 6% to 18% of the unforeseen variance of the unemployment rates over one year are explained by changes in neighboring countries. As we move to the larger reference group of a sample of European OECD countries this share reduces to between 3% to 14% and when the United States are included between 3% to 11% are the levels suggested. In consequence increases are more significant for European OECD countries, but integration is still highest with neighboring countries. This

	1. Quarter		1 Year		3 Years	
	60-79	80-98	60-79	80-98	60-79	80-98
Vienna	0.018	0.038	0.143	0.072	0.151	0.128
Lower Aust.	0.000	0.073**	0.022	0.107*	0.014	0.227***
Burgenland	0.009	0.023	0.037	0.042	0.030	0.118*
Styria	0.001	0.026*	0.156	0.128	0.253	0.201
Carinthia	0.004	0.001	0.084	0.030	0.123	0.018
Upper Austr	0.009	0.019	0.048	0.056	0.064	0.091
Salzburg	0.009	0.005	0.036	0.089	0.073	0.130
Tyrol	0.000	0.006*	0.039	0.109	0.101	0.154
Vorarlberg	0.037	0.059	0.051	0.086	0.049	0.102

*** signifies that the value is larger than the reference value of the same time period at the 1% confidence level; ** at the 5% level; * at the 10% level. Confidence levels are based on 1000 simulations of the model

{Table 4: Prediction Error Due to the international Factor (European OECD + US)

confirms our conjecture that trade is the major transmission mechanism for integration, since over 40% of foreign trade are with Germany and Italy. All other European OECD countries in total account for about a further 30% and non-European OECD countries for 5%. Furthermore our results for the 1980 to 1998 period seem to be well in line with the general view held on Austrian provinces. Vienna and Burgenland and to a lesser degree Carinthia are in general seen to be relatively dependent on domestic demand, while the industrial provinces (Lower Austria and Styria) as well as the Western provinces are seen as more export oriented.

A share of the forecast variance of about 10% in average, however, does not seem to be very high at first sight. One reason for this may be seasonality of the data. To address, how sensitive results are to deseasonalizing, we also estimated model (B) with annual average unemployment rates reaching from 1961 to 1997. While this estimation suffers from degree of freedom problems, it does confirm the view that seasonality is primarily a regional phenomenon. Using annual data changes our estimate of the share of international shocks in the total variance share over the time period 1961-97 to between 10% (Burgenland) and 47% (Vorarlberg). In particular the share of more seasonal regions is affected substantially. In Carinthia, as the most extreme example, the share of the international shock in the one year ahead forecast error is now 0.46%.[13]

[13] We also experimented with splitting the annual data set into two subsamples. Again this changes the results concerning tourist regions substantially. Increases in the international factor become much larger for them, however, due to the shortness of the data set results remain insignificant throughout.

6.2 Did Regional Rooms to manoeuvre decrease?

Since the sum of h-step ahead forecast error shares for all three components, which explain regional unemployment rates (international, national and regional shocks) must add to unity. The question arises, whether the found increase in the share of international shocks was accompanied by a reduction in the share of the national or the regional component. To analyse this issue Tables 5 and 6 report the share forecast error due to the regional and the national component. Significant reductions in the regional share of the forecast error are rare. Regional shocks' share of the one year ahead prediction error reduced significantly only in Vienna and Lower Austria. This, however, has to be attributed to an increase in the importance of the national factor, as the Viennese labor market became more linked with the labor market of lower Austria through suburbanisation in the eighties and nineties, rather than to an increase in the international factor. The only further province where the share of the region in the forecast error has reduced is Vorarlberg. In all other provinces the regional share in the one year ahead prediction error has actually increased. In the case of the three year ahead prediction error the share of the region has fallen only in three provinces but even there changes were insignificant and results on the one quarter ahead prediction error are also insignificant throughout.

An explanation that focuses on a reduced role for the national factor seems a little more promising. Here the share of the national shock in the one year ahead prediction error has reduced in all provinces but Vienna. The lacking, significance of results, however, suggests that the evidence presented is not very clear cut. It seems that a mixture of both declining regional and national shares - which was slightly more pronounced with national shares, have accompanied globalization.

6.3 Where is Globalization felt most strongly?

As a final experiment we are interested in which region types are most dependent on international development. To address this issue we aggregate data on an 82 district level according to a

	1. Quarter		1 Year		3 Years	
	60-79	80-98	60-79	80-98	60-79	80-98
Vienna	0.751***	0.515	0.694**	0.489	0.691**	0.380
Lower Aust.	0.402	0.341	0.461*	0.362	0.453	0.366
Burgenland	0.208	0.221	0.264	0.303	0.246	0.344
Styria	0.231	0.293	0.278	0.302	0.236	0.343
Carinthia	0.382	0.503*	0.455	0.525	0.357	0.697
Upper Austr	0.226	0.252	0.232	0.330	0.194	0.370
Salzburg	0.305	0.351	0.284	0.292	0.316	0.325
Tyrol	0.568	0.823***	0.610	0.706	0.541	0.648
Vorarlberg	0.706	0.768	0.691	0.677	0.568	0.641

***signi…es that the value is larger than the reference value of the same time period at the 1% con…dence level; ** at the 5% level; * at the 10% level. Con…dence levels are based on 1000 simulations of the model

{{Tabble 5: Prediction Error Due to the regional Factor (Germany and Italy)

	1. Quarter		1 Year		3 Years	
	60-79	80-98	60-79	80-98	60-79	80-98
Vienna	0.242	0.410*	0.199	0.403**	0.200	0.457***
Lower Aust.	0.558	0.523	0.464	0.454	0.447	0.381
Burgenland	0.767	0.738	0.688	0.632	0.641	0.544
Styria	0.759**	0.631	0.696*	0.527	0.648**	0.411
Carinthia	0.601*	0.486	0.510	0.410	0.574***	0.261
Upper Austr	0.746	0.667	0.708*	0.560	0.655***	0.505
Salzburg	0.675	0.617	0.673	0.575	0.574	0.515
Tyrol	0.431	0.177	0.366***	0.178	0.392**	0.212
Vorarlberg	0.294	0.231	0.272	0.230	0.298	0.252

***signi…es that the value is larger than the reference value of the same time period at the 1% con…dence level; ** at the 5% level; * at the 10% level. Con…dence levels are based on 1000 simulations of the model

{{Table 6: Prediction Error Due to the national Factor (Germany and Italy) functional classification by Palme (1995). This classification divides Austrian political districts into nine different structural groups according to a number of criteria: specialization on either industry, services or agriculture, capacities, average wages and enterprise size in industry, tourist capacity and number of overnight stays by tourists (see: Palme (1995a)):

The groups formed according to these criteria are:

1. Metropoles which includes only the city of Vienna - also a Nuts II region
2. Large Cities - this includes the five large cities of Graz, Linz, Salzburg and Innsbruck and Klagenfurt. These share a high population as well as relatively large shares of employment and large capacities in the service industries
3. Suburban Districts: These include the suburban areas around Vienna and the large cities where out-commuting on a daily basis is prevalent.
4. Middle sized towns this category consists of 9 medium sized towns in Austria characterized by a high share of service employment, but substantially smaller capacities and population than the large cities.
5. The 16 intensive Industrial districts located mostly in Upper Austria, Styria and Vorarlberg are primarily characterized by relatively large industrial enterprises and high capacities in the industrial sector.
6. intensive tourist districts - these are 10 political districts with a high share of tourism and a large Hotel capacity in the western and central alpine regions of Austria.
7. extensive Industrial districts - in contrast to intensive industrial districts these 17 districts are characterized by smaller industrial capacities, a below average wage industrial wage rate, but a low share of agricultural employment.
8. peripheral tourist districts - these are ten districts with very low industrial capacities a high share of agriculture togther with a high share of overnight stays by tourists

	Italy and Germany			European OECD		
	international	national	regional	international	national	regional
Large City	0.027	0.543	0.429	0.204	0.722	0.073
Vienna Suburbs	0.015	0.331	0.653	0.841	0.046	0.113
Medium Sized Towns	0.003	0.688	0.309	0.269	0.033	0.698
Industrial Intensive	0.716	0.158	0.126	0.644	0.101	0.255
Tourism Intensive	0.520	0.231	0.249	0.102	0.884	0.011
industrial extensive	0.112	0.635	0.252	0.366	0.411	0.223
Tourist Periphery	0.243	0.479	0.278	0.050	0.942	0.007
industrial Periphery	0.297	0.245	0.458	0.405	0.592	0.003

Estimates are based on annual data from 1986 to 1998. Region types are de…ned according to Palme (1995). int - refers to the international factor, nat.- to the national factor and reg. - to the regional factor

{{Table 7: One year Ahead Prediction Error Shares by functional Region Types

9. peripheral industrial districts - are 15 districts characterized by much the same characteristics as the peripheral tourist regions but relatively fewer overnight stays by tourists.

Unfortunately, since labor market statistics in Austria are provided on a system of labor market districts only, and since these districts are not of the same size as political districts we have to aggregate the suburban districts of large cities up with the large cities themselves. This leaves us only with the Vienna environs as a suburban area. Thus we estimate the model for the aggregates of these 8 region types[14] Furthermore, data on district unemployment rates in Austria are available only for the period 1986 to 1997 on an annual frequency, which results in substantial degree of freedom problems

The estimation results are shown in table 7. While they are subject to a number of criticisms, they do con…rm our earlier contention that industrial districts are more dependent on international developments. All three industrial region types show shares of the international shock in the one year ahead forecast error higher than those of large cities or medium sized towns. Results on Tourist regions and on the Vienna suburbs, however, hinge strongly on the proxy used for the rest of the world developments In particular the if European OECD countries are used as a proxy Viennese suburbs and the intensive tourism districts seem to be highly dependent on international factors, too. When only Germany and Italy are used Peripheral tourist regions are more highly

[14] A map of the typology taken from Palme (1995a) is included in the appendix.

internationalized. In the case of the tourist regions this may be attributed to the use of annual data and different visitor structures in the regions As already discussed above once seasonality is removed tourist regions are more highly dependent on international shocks, and peripheral tourist regions tend to be regions with a high share of German tourists among the foreign visitor. In the case of Vienna suburbs results the low share of the national factor casts some doubt on the plausibility of results

7 Conclusions

Globalization has been one of the buzzwords of the economic debate. It has been argued that globalization a) has increased the dependence of regions and nations on developments outside their territory at the expense of their autonomy and b) has affected different regions in different ways. This paper applied a measure of integration suggested by Vinals and Jimeno (1996) to test three issues directly, at the example of quarterly Austrian unemployment rates In addition to presenting some evidence on the regional effects of globalization this paper shows that this measure can be derived from a stylized regional labor market model.

In our empirical work we find that dependence on international developments in unemployment rates has indeed increased in the 1980's and 1990's relative to the 60's and 70's and discover some addition al stylized facts of the workings of integration. In particular

1. Developments over the horizon of one year are more strongly influenced by international developments in the period 1979-1998 than in the two decades before. Results concerning the forecast horizon of a quarter or three years are much less significant.

2. There is no clear cut evidence whether increased integration has primarily affected regional or national shares. Our evidence, however, slightly favors a decline in national shares.

3. Changes in our measure of globalization between the two time periods become more significant, as more European countries are included, while levels fall. When the United States

are included, however, almost all significance is removed in our results. This suggests that at least in Austria globalization has been strongly associated with European integration.

4. Our results using data on provinces as well as the short annual time series information on districts suggest that integration is more strongly felt in industrial regions and regions near to the border. Results concerning tourist regions in contrast, are highly sensitive to the choice of data frequency. Quarterly data suggest low labor market integration due to high seasonality. Annual data suggest substantially higher integration

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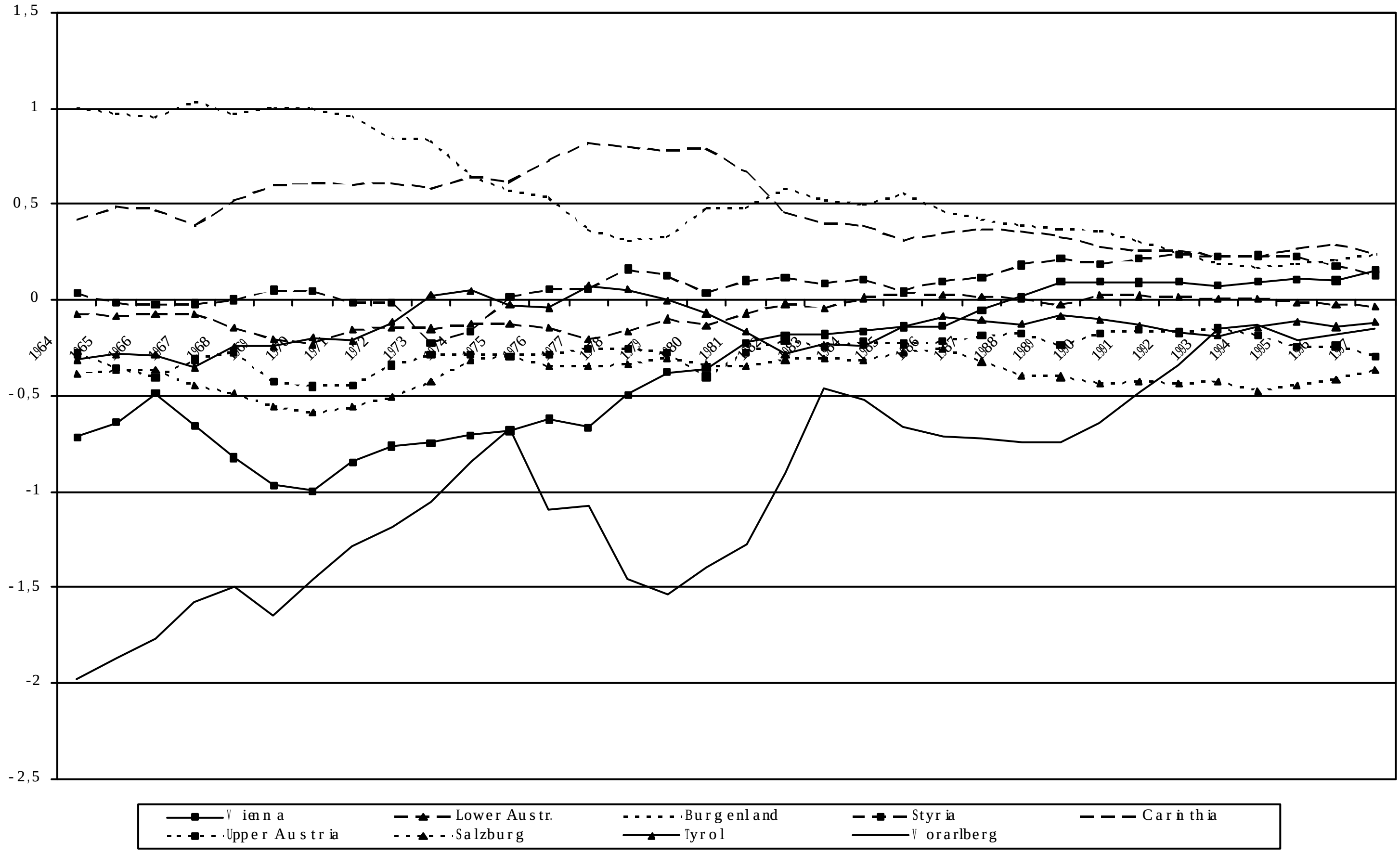
igure 1: Development of log relative unemployment rates by Counties in Austria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igure 2: Development of log relative unemployment rates by Districtsin Austria