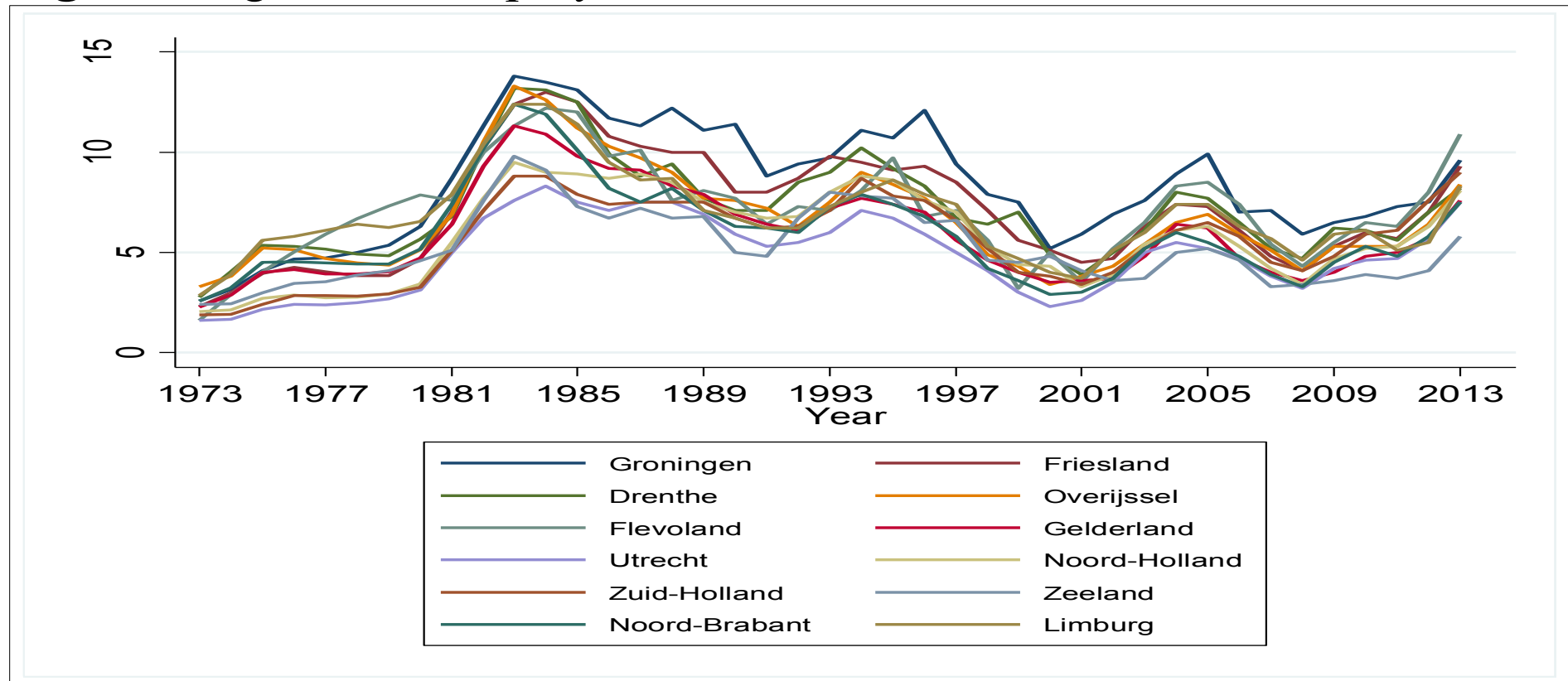


## Two-stage approach strong and weak cross-sectional dependence

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**Figure.** Regional unemployment rates in the Netherlands, 1973-2013



$$\hat{e}_{rt} = u_{rt} - \hat{\gamma}_{0r} - \hat{\gamma}_{1r}u_{Nt}$$

$$\hat{e}_{rt} = \alpha_0 + \alpha_1\hat{e}_{rt-1} + \alpha_2 \sum_{j=1}^R w_{rj} \hat{e}_{jt} + \alpha_3 \sum_{j=1}^R w_{rj} \hat{e}_{jt-1} + (\mu_r) + (\lambda_t) + \varepsilon_{rt}$$

**Table.** Strong cross-sectional dependence

	$\gamma_{0r}$		$\gamma_{1r}$	
<b>Groningen</b>	-0.069	(0.377)	<b>1.362</b>	(0.058)
Friesland	-1.418	(0.377)	1.341	(0.058)
Drenthe	0.004	(0.377)	1.160	(0.058)
Overijssel	-0.819	(0.377)	1.208	(0.058)
Flevoland	0.284	(0.377)	1.098	(0.058)
Gelderland	-0.940	(0.377)	1.108	(0.058)
Utrecht	-0.788	(0.377)	0.914	(0.058)
North-Holland	-0.781	(0.377)	1.063	(0.058)
South-Holland	-0.200	(0.377)	0.945	(0.058)
Zeeland	0.026	(0.377)	0.842	(0.058)
<b>North-Brabant</b>	-0.974	(0.377)	<b>1.119</b>	(0.058)
Limburg	0.603	(0.377)	1.011	(0.058)
$R^2$	0.918			
Log-Likelihood	-537.0			

**Table.** Weak cross-sectional dependence

	Panel A		Panel B		
	(1)	(2)	(3)	(4)	(5)
$\alpha_0$			0.001 (0.024)		
$\alpha_1$	0.679 (0.039)	0.716 (0.037)	0.643 (0.036)	0.687 (0.038)	0.689 (0.040)
$\alpha_2$	<b>0.756</b> <b>(0.025)</b>	<b>0.252</b> <b>(0.073)</b>	<b>0.147</b> <b>(0.057)</b>	<b>0.154</b> <b>(0.058)</b>	<b>0.240</b> <b>(0.074)</b>
$\alpha_3$	-0.460 (0.047)	-0.002 (-0.038)	0.054 (0.081)	0.058 (0.093)	0.083 (0.124)
Spatial fixed effects	Yes	Yes	No	Yes	Yes
<b>Time fixed effects</b>	No	Yes	No	No	Yes
$R^2$	0.942	0.955	0.455	0.456	0.494
Log-Likelihood	-481.3	-368.9	-379.8	-379.2	-359.5

*Notes:* Standard errors are reported in parentheses; Panel A reports the dynamic spatial panel data model results, while Panel B reports the de-factored (second-stage) model results; except for column (3), the bias corrected ML estimator of Lee and Yu (2010b) is applied for models containing time-period fixed effects, and of Yu et al. (2008) for models without time-period fixed effects.

$$(u_{rt} - \gamma_{0r} - \gamma_{1r}u_{Nt}) = \alpha_0 + \alpha_1(u_{rt-1} - \gamma_{0r} - \gamma_{1r}u_{Nt-1}) + \alpha_2 \sum_{j=1}^R w_{rj} (u_{jt} - \gamma_{0j} - \gamma_{1r}u_{Nt}) + \alpha_3 \sum_{j=1}^R w_{rj} (u_{jt-1} - \gamma_{0j} - \gamma_{1r}u_{Nt-1}) + \varepsilon_{rt}$$

$$u_{rt} = \alpha_0 + \gamma_{0r} - \alpha_1\gamma_{0r} - \alpha_2 \sum_{j=1}^R w_{rj} \gamma_{0j} - \alpha_3 \sum_{j=1}^R w_{rj} \gamma_{0j} + \alpha_1 u_{rt-1} + \alpha_2 \sum_{j=1}^R w_{rj} u_{jt} + \alpha_3 \sum_{j=1}^R w_{rj} u_{jt-1} + \underbrace{\gamma_{1r}(1 - \alpha_2)}_{\beta_{4r}} \mathbf{u}_{Nt} + \underbrace{\gamma_{1r}(-\alpha_1 - \alpha_3)}_{\beta_{5r}} \mathbf{u}_{Nt-1} + \varepsilon_{rt}$$

**Table** Simultaneous approach to strong and weak cross-sectional dependence

<i>Strong cross-sectional dependence</i>								
	$\beta_{4r}$		$B_{5r}$		$\beta_{4r}/(1-\alpha_2)$		$B_{5r}/(-\alpha_1-\alpha_3)$	
Groningen	0.913	(0.114)	-0.675	(0.152)	1.034	(0.169)	<b>0.910</b>	(0.054)
Friesland	0.986	(0.112)	-0.736	(0.143)	1.118	(0.157)	0.991	(0.045)
Drenthe	1.020	(0.113)	-0.906	(0.145)	1.155	(0.156)	1.221	(0.035)
Overijssel	1.092	(0.111)	-0.919	(0.134)	1.237	(0.146)	1.238	(0.032)
Flevoland	0.925	(0.108)	-0.824	(0.131)	1.048	(0.162)	1.111	(0.035)
Gelderland	0.881	(0.109)	-0.726	(0.127)	0.998	(0.168)	0.978	(0.040)
Utrecht	0.696	(0.107)	-0.590	(0.128)	0.789	(0.196)	0.794	(0.054)
North-Holland	0.814	(0.108)	-0.636	(0.132)	0.922	(0.174)	0.857	(0.050)
South-Holland	0.764	(0.108)	-0.628	(0.126)	0.866	(0.181)	0.846	(0.048)
Zeeland	0.637	(0.111)	-0.550	(0.127)	0.722	(0.215)	0.740	(0.059)
North-Brabant	1.079	(0.106)	-0.949	(0.123)	1.223	(0.142)	<b>1.279</b>	(0.028)
Limburg	0.926	(0.113)	-0.839	(0.126)	1.050	(0.166)	1.130	(0.033)
<i>Weak cross-sectional dependence</i>								
$\alpha_1$	0.664	(0.038)						
$\alpha_2$	<b>0.118</b>	(0.059)						
$\alpha_3$	0.079	(0.082)						
$R^2$	0.956							
Log-Likelihood	-362.3							

*Notes:* Standard errors are reported in parentheses; spatial fixed effects included. The bias corrected ML estimator developed in Yu et al. (2008) is applied. As noted in the main text, a direct comparison with Table 3 requires further calculations, which are reported in the last two columns.