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Unemployment Polarisation and Club Convergence in Türkiye

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ABSTRACT

Turkish economy has undergone massive transformation during the 2000s. Annual economic growth reached a peak of 10% in the early 2000s. However, the side effects of global financial crises and the internal macroeconomic imbalances shift the growth trajectory of Türkiye into a new path of unstable economic growth. While macroeconomic consequences are densely discussed we know less about the adjustment of local labour markets. To fill this gap, we examine the club formation of Turkish regions by analysing their unemployment trajectories during the post 2000s. Our findings show that despite rapid economic growth Turkish regions get extremely polarised and form distinct convergence clubs. Remarkably polarisation is higher for the female population. Geographically, polarisation is in the form of an isolation for the least developed south-eastern regions and some of the developed urbanised western regions. Additionally, our robustness exercises indicate higher polarisation after 2013 as Turkish economic growth starts to become more volatile and less sustainable. Finally, our spatial extensions show that impact of spatial proximity has significant influence on the accurate extent of unemployment deprivation.

1 | Introduction

Economic growth which does not create sufficient jobs is unhealthy and non-inclusive. Recent evidence from developing countries validate this, as job creation of their growth experiences is limited (e.g. see Cuaresma (2003); Silvapulle, Moosa, and Silvapulle (2004); Abubakar and Nurudeen (2019); Onoran (2008) among others). Helpman, Itskhoki, and Redding (2010) also argue that while globalisation opens new opportunities for growth and development, it has varying consequences on labour markets.

While cross-country debates on unemployment has received substantial interest, Brown and Sessions (1997) show that regional dimension of unemployment also stands central for understanding the local labour market dynamics. Later, Elhorst (2003) points-out how spatial disparities in unemployment can be contextualised by combining theory with empirics. Mameli, Tselios, and Rodríguez-Pose (2021) add the policy implications of regional unemployment problem. Furthermore, empirical evidence from different countries validates that regional progress in economic growth does not always imply improvements in labour market conditions (e.g. see Partridge and Rickman (1997); Neibuhr (2003); Newell and Pastore (2006); Monastiriotis and Martelli (2021) among others). Inevitable outcome of the asymmetry between regional growth and local unemployment patterns creates more demand to contextualise how to evaluate the path of disparities in regional labour markets.

The background of regional disparities in labour markets can be best linked with the seminal contributions of Blanchard and

Katz (1992, 1997) who argue the necessity to explore labour markets and macroeconomic indicators at the regional level. Blanchard and Katz (1992) show that long-run labour market outcomes should converge towards an equilibrium via two main channels: (i) unemployed individual in a region can move to another where labour demand is far beyond the local supply of labour, (ii) capital accumulates towards low-wage location which further fosters job creation. These debates form the theoretical background and motivate the scholarly literature to analyse the convergence trends in the unemployment rates (e.g. see Freeman (2000), Carmeci and Mauro (2002), Binet and Facchini (2013), Abubakar and Nurudeen (2019) and Maza (2022), Duran (2022)).

However, our screening of the literature shows that a detailed discussion on the formation of convergence clubs together with spatial dimension and demographic heterogeneity in unemployment is still missing. While Iacus and Porro (2015), Danilenko, Demidova, and Signorelli (2018) discuss the possibility of club-convergence in unemployment rates they do not explore the spatio-temporal dynamics of unemployment driven club-convergence. We argue that detection of convergence clubs and analysing the spatio-temporal origins are crucial as they will be instrumental for understanding the local labour market polarisation. Remarkably, generalised labour market policies will be ineffective if the extent of local polarisation is not defined properly.

To fill this gap, this paper analyses the regional unemployment disparities by examining the club convergence in a spatially dual economy, Türkiye. We use the recent discussions on the club convergence as introduced by Phillips and Sul (2007). Additionally, we consider certain labour market features of Türkiye by examining the gender decomposition and spatio-temporal dynamics of the club formation.

Our findings contribute to the discussions on regional differences in labour markets from several pillars. Majority of the studies focus on the factors affecting regional disparities in unemployment by disregarding the club formation (e.g. see Badinger and Url (2002)). However, neglecting the polarisation in local labour markets will undermine the true impact of economic policies targeting territorial cohesion. Second, regional studies mostly investigate the club formation of income levels (e.g. see Monfort, Cuestas, and Ordonez (2013)). However, investigating the local differences in unemployment enables to discuss the inclusiveness of territorial policies that aim to boost local development. Finally, we incorporate a spatio-temporal pattern to the club formation analyses and find-out that the accurate impact of unemployment in local labour markets can be best understood when spatial proximity is included. We argue that temporal and spatial dynamics of club convergence are central for improving the effectiveness of territorial policies while harmonising local labour markets.

Finally, examining Türkiye includes important novelties. First, Türkiye is in a cycle of jobless economic growth (Telli, Voyvoda, and Yeldan 2006). Meanwhile, Türkiye has been witnessing a structural change by liberalising its goods market in the early 1980s, accelerating the financial liberalisation after 1990s and raising the level of political integration by earning the EU candidacy status in the early 2000s. Although during the 2000s economic growth jumps to 10%, Türkiye failed to exceed its long run economic growth of 5%. Remarkably, unemployment rate swings around 10% during this period of rapid change. Therefore, Turkish case is a convenient example for questioning the asymmetric labour market outcomes of economic progress at the local level.

A second vital peculiarity of Türkiye regards to the policy insensitive spatial duality (Doğruel and Doğruel (2003); Karahasan (2020a)) and spatially divergent convergence clustering within the borders of the country (Aksoy, Taştan, and Kama (2019) and Karahasan (2020b)). Given its dual economic structure, lessons from Türkiye are vital for constructing territorial policies to harmonise local labour markets. Moreover, these lessons serve as benchmarks for the developing countries with similar socio-economic fundamentals.

Section 2 reviews the literature and discusses the contextualisation of club convergence in labour markets. Section 3 introduces the methodology, Section 4 provides the results and the paper ends with conclusions in Section 5.

2 | Prior Literature

Studies test the Okun's law at the country level (see e.g. Silvapulle, Moosa, and Silvapulle (2004); Cazes, Verick, and Al Hussami (2013) among others) and underline the potential asymmetries between economic policies and labour market outcomes. There is also rising interest on the regional dimension. Freeman (2000), Binet and Facchini (2013), Abubakar and Nurudeen (2019) and Maza (2022) show that links between regional growth and local unemployment vary at the regional level.

While examination of the relationship between regional growth and unemployment trends is crucial, our review of the literature shows that the matter is densely analysed, and the Turkish experience is investigated from a regional perspective (Duran 2022). However, what is more central is the overlooked outcome of this process which we refer as the club convergence of unemployment patterns.

To understand why local labour markets are central it is essential to explore different challenges of local economies. Among many dimensions, job creation potential of regions and their resilience capacity are densely analysed. Di Caro (2018) underlines that employment in manufacturing and female employment are vital to assess the regional resilience to economic crises. Similarly, Faggian et al. (2018) argue that local labour markets are central to understand how regions absorb economic turmoils. Likewise, Giannakis and Bruggeman (2020) highlight that employment growth is a key indicator for understanding how different region typologies (urban, rural and intermediate) are influenced from economic crises. In short, resilience of regions can be best understood by analysing how local labour markets react to economic developments.[1]

Meanwhile, impact of local characteristics to shape the resilience capacity of labour markets is also crucial. Di Cataldo and

Rodriguez-Pose (2017); Di Caro and Fratesi (2018) argue that regional conditions (e.g. innovation, human capital etc.) have significant influence on the employment creation. Ezcurra and Rios (2019) show that higher quality of government is a critical factor to restore the employment losses across the EU regions. Discussions on the extent of local resistance to macroeconomic downturns show that unemployment patterns are valid candidates for examining regional resilience.

Another inevitable dimension is the heterogeneity across different sub-groups of the population. Bruno, Marelli, and Signorelli (2014) show that youth unemployment and share of individuals in neither employment, education nor training in the EU jump during the global financial crisis. Similarly, Scandurra, Cefalo, and Kazepov (2021) underline the territorial divide in youth unemployment across the EU regions. Meanwhile, Lillydahl and Singell (1985) show that unemployment differentials across the United States (US) regions become visible after the female-male decomposition is considered. Bock (2017) confirms that female unemployment is more important for understanding the rural-urban separation across the EU regions. Similarly, Baussola and Mussida (2017) show that gender gap in unemployment is a core problem for Italy and the UK. Note that gender-based differences in local labour markets is also visible in developing countries. Rakowska (2014) for Poland and Lesuisse (2022) for the comparison of the core EU-15 with Central Eastern European (CEE) countries suggest the importance of gender for understanding the labour market dynamics.

Another dimension is the distinction between protected and market economies. Rodriguez-Pose and Fratesi (2007) examine the southern European countries and suggest that peripheral regions which depend primarily on public employment are less affected from changes in market conditions. These protected economies is known as the sheltered economies. Fratesi and Rodriguez-Pose (2016) use the same narrative for the 2008 crisis' effects on the EU regions. Findings suggest that dominance of public sector in a region creates local sheltered economies and employment rates are less affected from the macroeconomic instabilities. Therefore, pre-crises sheltered economies do not suffer from jump in unemployment compared to others that rely on market conditions.

These theoretical debates motivate empirical studies to analyse local labour markets. McCormick (1997) for UK, Jimeno and Bentolila (1998), Lopez-Bazo et al. (2002), Lopez-Bazo et al. (2005), Bande, Fernández, and Montuenga (2008), Villaverde and Maza (2021) for Spain, Badinger and Url (2002) for Austria, Monastiriotis and Martelli (2021), Herod, Gourzis, and Gialis (2021) for Greece, Garloff (2019), Bonin et al. (2020) for Germany and Binet and Facchini (2013) for France underline the existence of regional unemployment disparities by highlighting the asymmetry between economic growth and regional employment. Moreover, Baddeley, Martin, and Tyler (1998), Overman and Puga (2002), Neibuhr (2003), Basile and Benedictis (2008), Ferragina and Pastore (2008), Marelli, Patuelli, and Signorelli (2012), Beyer and Stemmer (2016), Doerr and Gambacorta (2020) show the spatial disparities in unemployment rates within the EU. Additionally, Newell and Pastore (2006), Blažek and Netrdova (2012) show the spatial polarisation in the labour markets for the CEE countries. Finally, evidence from the US, Brazil, India, Japan, China and Egypt underline the rising regional disparities in unemployment figures (Partridge and Rickman (1997); Freeman (2000); de Figueiredo (2010); Khan, Shamshad, and Hassan (2012); Okada et al. (2020); Shi et al. (2020); Al-Ayouty and Hassaballa (2020)).

While these studies underline the spatial heterogeneities at country level, they do not discuss the club formation and spatio-temporality in unemployment rates. Another possibility is the convergence for only a set of regions. That is, regions can diverge from each other by forming heterogeneous local labour markets. One must note the place of local labour markets and how they are discussed from the regional disparity perspective. Pellegrini (2002) analyses the evolution of employment patterns across the Italian regions and suggests that strong polarisation in employment rates creates heterogenous local labour markets. Moretti (2010) examines the endogenous evolution of skill and productivity differences which create agglomeration-based clusters across local labour markets. Recently, Overman and Xu (2022) show that spatial clustering of wages and employment patterns forms local labour markets and regional polarisation for the UK (see e.g. Gordon (2003); Combes, Duranton, and Gobillon (2008); Niebuhr et al. (2009); Lindley and Machin (2014) for additional discussions on the spatiality and formation of local labour markets). These discussions remind the importance of labour market polarisations. This polarisation in return forms the background for identifying local labour markets and using spatiality to define the accurate extent of unemployment deprivation.

To understand the club formation in unemployment rates, we first review the club formation literature as a reaction to the traditional convergence analyses. The neo-classical growth theory has been a benchmark to examine convergence in economic output (Barro and Sala-i Martin; 1990, 1992). The beta convergence approach highlights that due to decreasing returns, cross regional differences in income will tend to diminish and local disparities will vanish conditional on local conditions (e.g. infrastructure, human capital). However, the convergence framework fails to explain the continuous regional disparities. Quah (1993) argues that convergence theory cannot explain the transition within income distribution. Likewise, Quah (1996a, 1996b) show that detected convergence can be club specific and does not necessarily imply an overall decline in inequalities. Rey (2001) incorporates the role of regional networks to show that transition within the distribution can be conditional on the performance of spatial proximity.

Finally, Phillips and Sul (2007 and 2009) offer a methodology based on a non-linear time-varying factor model. The idea is to group regions in different convergence clubs and examine their transition trajectories. This approach does not rely on predetermined grids which are used to group regions in the distributional dynamics studies. Phillips and Sul (2007) approach is densely used to understand club formation for output growth (see e.g. Monfort, Cuestas, and Ordonez (2013); Rodríguez-Benavides, López-Herrera, and Venegas-Martínez (2014); Apergis, Panopoulou, and Tsoumas (2010)). Meanwhile, it is also applied to different social and economic variables. Apergis, Christou, and Miller (2012) and Akram,

Singh, and Sahoo (2023) for financial integration, Apergis and Christou (2016), Amorim et al. (2023) for environment and energy, Rath, Panda, and Akram (2023) for ICT, Apergis, Christou, and Hassapis (2013) and Regis, Cuestas, and Chen (2015) for fiscal policy, Mendez (2020) for human capital development use the Phillips and Sul (2007) approach to investigate club convergence.[2]

At this stage, it is fundamental to contextualise the club-convergence in unemployment patterns. Our departure is the theoretical remarks of Blanchard and Katz (1992, 1997). It is either the local labour market dynamics or capital accumulation towards low-wage locations that fosters the convergence patterns in unemployment rates. For the former case the main expectation is the labour absorption capacity of a region where local labour demand is higher than the local labour supply. This is expected to push the unemployed people in a region towards others with more job prospects. For the latter case, the rising capital formation in a low-wage region can create more job opportunities which might balance the labour markets in different locations.

While convergence in labour markets has been a scholarly concern, literature shows relatively less interest in the club convergence of regional labour markets.[3] Cuestas, Monfort, and Ordóñez (2015) and Monfort, Ordóñez, and Sala (2018) examine the convergence clubs in unemployment for the CEE and the EU countries. However, spatial heterogeneities and club formation for labour markets at the country level is missing. The only exception is Maynou, Ordóñez, and Silva (2022) who investigate the club convergence of the population that is neither in education nor in employment. However, this study obvers the whole EU area and focuses on the impact of unemployment on the rising inactivity among the young population.

This brief review shows that club convergence in labour market outcomes has not been a core concern from a spatial perspective. Therefore, we divert our full-interest towards exploring the clustering of unemployment in a spatially dual economy, Türkiye. We argue that examining the club convergence in unemployment is an important step for understanding the effectiveness of labour market policies. It must be noted that harmonisation in local labour markets can be achieved only if the impact borders of policies are clearly identified at the regional level. Existence of convergence clubs refers to the heterogenous long-run unemployment trajectories and individual steady states. In our view descriptive and spatial analyses of unemployment rates will be insufficient to explore how regions locate and reach their steady states. Without proper identification of local labour markets, policies are threatened by ineffectiveness.

3 | Methodology

Phillips and Sul (2007) offered a non-linear approach where transition path of regions is used to determine club formation. Phillips and Sul (2007, 2009) and Du (2017) highlight that this approach enables heterogeneous agent behaviour and is highly robust to the stationarity property of the series considered.

The approach relies on a log *t test* which is based on a non-linear time varying factor model. Equation (1) shows a panel data (X_{it}). We decompose the factor model into its systematic (g_{it}) and transitory (a_{it}) components. μ_t is the single common component and δ_{it} is the time-varying idiosyncratic element (loading coefficient).

$$X_{it} = \left(\frac{g_{it} + a_{it}}{\mu_t}\right)\mu_t = \delta_{it}\mu_t \tag{1}$$

This non-linear model doesn't impose any assumption on trend stationary and stochastic non-stationary. Common factor is removed via Equation (2). h_{it} traces out the transition of each cross-section to panel average and defined as the relative transition parameter.

$$h_{it} = \frac{X_{it}}{\frac{1}{N}\sum_1^N X_{it}} = \frac{\delta_{it}}{\frac{1}{N}\sum_1^N \delta_{it}} \tag{2}$$

The cross-section mean of Equation (2) is unity. Phillips and Sul (2007) argued that if the loading coefficient δ_{it} converges to δ then the relative transition parameter will converge to unity. Under this condition in the long run cross-section variance of h_{it} should converge towards zero (Equation (3)). However, this does not necessarily imply an overall convergence; rather convergence process can be created by convergence clubs.

$$H_{it} = \frac{1}{N}\sum_{i=1}^{N}(h_{it} - 1)^2 \to 0, if \lim_{t\to\infty}\delta_{it} = \delta \text{ for all } i \tag{3}$$

Du (2017) defined the existence of convergence as relative convergence (Equation (4)). This condition also requires the convergence of the time-varying factor loading coefficient (Equation (5)).

$$\lim_{t\to\infty}\frac{X_{it}}{X_{jt}} = 1, \text{ for all } i \text{ and} \tag{4}$$

$$\lim_{t\to\infty}\delta_{it} = \delta, \text{ for all } i \tag{5}$$

To test the existence of convergence, Phillips and Sul (2007) model the loading coefficient in a semiparametric way which allows heterogeneity over time and across individuals:

$$\delta_{it} = \delta_i + \frac{\sigma_i \xi_{it}}{L(t)t^{\alpha}} \tag{6}$$

δ_{it} is the fixed loading parameter, ξ_{it} is *i.i.d.* (0,1) for each i, but can be weakly dependent over t. The key element of Equation (6) is $L(t)$ which is a slowly varying function such as $\log(t)$, $\log\{\log(t)\}$ or $\log^2(t)$. Based on Monte Carlo simulations Phillips and Sul (2007, 2009) underline that setting $L(t)$ to $\log(t)$ yields the least distortions. Finally, the rate at which cross-section variation through the transition decays to zero is measured by α.

Phillips and Sul (2007) propose a regression t test with the following null and alternative hypotheses of convergence:

$$H_0 : \delta_i = \delta \text{ and } \alpha \geq 0 \tag{7}$$

$$H_A : \delta_i \neq \delta \text{ and } \alpha < 0 \tag{8}$$

The hypothesis test relies on a two-step procedure. In step one, a cross-sectional variance ratio (H_1/H_t) is computed. Next, a robust t test statistic is calculated for the coefficient b Equation (9).

$$\log\left(\frac{H_1}{H_t}\right) - 2\log\{\log(t)\} = a + b\log(t) + \varepsilon_t \tag{9}$$

Note that, $t = [rT], [rT] + 1, ..., T$ with $r > 0$. This condition means that first r% of the data is disregarded. Based on Monte Carlo simulations Phillips and Sul (2007) underline that r should lie within the interval of [0.2, 0.3].[4] Finally, a one-sided t test is applied (t statistics is given in Equation (10)). Conventionally, at the 5% significance level the null hypothesis of convergence is rejected if the test statistic is lower than the critical value of −1.65.

$$t_b = \frac{\hat{b} - b}{s_b} \Rightarrow N(0, 1) \tag{10}$$

4 | Results

4.1 | Descriptive Findings

Unemployment data covers the 2004–2022 period for the NUTS - 2 regions (TurkStat 2023a).[5] Literature shows that there are labour market distinctions between male and female population in Türkiye (Ilkkaracan and Selim 2007; Tansel and Taşçı 2010). Additionally, unemployment rates vary significantly across different segments of the population (see e.g. Lillydahl and Singell (1985), Bock (2017) and Baussola and Mussida (2017)). Therefore, we also collect male and female unemployment figures.

Descriptive statistics are provided in Table 1. Average unemployment rates are around 10%. However, through-out the sample certain regions reach remarkable unemployment rates which are almost three times higher than the country average. This pattern is stronger for the female population as some regions reach an unemployment rate close to 45%. These findings give clues on the high unemployment variation across Turkish regions.

Post-2000s is an era of rapid change in Türkiye. Studies which investigate the regional dimension of this transformation point-out the winners and losers of the process (Karahasan 2020a). Additionally, despite progressive growth spatial disparities translate into different convergence clubs between west and east part of the country (Aksoy, Taştan, and Kama 2019; Karahasan 2020b). To assess the adjustment from labour market perspective we plot the comparison of initial values with the periodical change in the unemployment rates (Figure 1). Regardless of the gender those regions with an unemployment rate higher than the country average in 2004 realise very limited increase in their unemployment. These regions either witness no change or a decline in their unemployment. Meanwhile, there are regions with unemployment rate below the country average in 2004. These regions realise sharp increases in their unemployment. Overall, these early findings are signs of regional clustering in unemployment.

We plot the spatial distribution of unemployment rates for 2004 and 2022 (Figure 2). Historically the most under-developed south-eastern regions suffer the most from high unemployment. The dual pattern is getting stronger as unemployment is spilling over the most remote south-eastern regions in 2022. Additionally, some of the western regions which are the main drivers of economic growth also witness high unemployment. This reminds that the unemployment problem is not merely an issue of the least developed Turkish regions. Our findings also show higher unemployment rates for the female population. In 2022, the most deprived regions in female unemployment reached a rate around 24% which is higher than the average (19%) observed for the total population.

We argue that spatial visualisations give clues on the geography of unemployment problem. However, they do not analytically explain the temporal evolution of unemployment. To understand how regions cluster, one must combine the spatial distribution of unemployment problem with the historical transition. Otherwise, it would be incomplete to understand how regions transit through varying steady state unemployment rates and form the so-called convergence clubs.

4.2 | Baseline Results on Club Convergence

This sub-section provides the baseline results for club convergence in unemployment rates.[6] The log(t) test results are reported in Table 2.[7] Our test statistic for all population groups is lower than the critical value and we reject the null hypothesis of convergence.

Failure to detect convergence does not cancel out the potential convergence within sub-groups of the sample. Therefore, we

TABLE 1 | Descriptive statistics.

	Observations	Mean	St. dev	Min.	Max.
Unemployment rate (% total)	494	10.58	4.45	1.8	33.5
Unemployment rate (% male)	494	9.98	4.45	2	32.7
Unemployment rate (%, female)	494	11.67	5.82	0.9	42.1

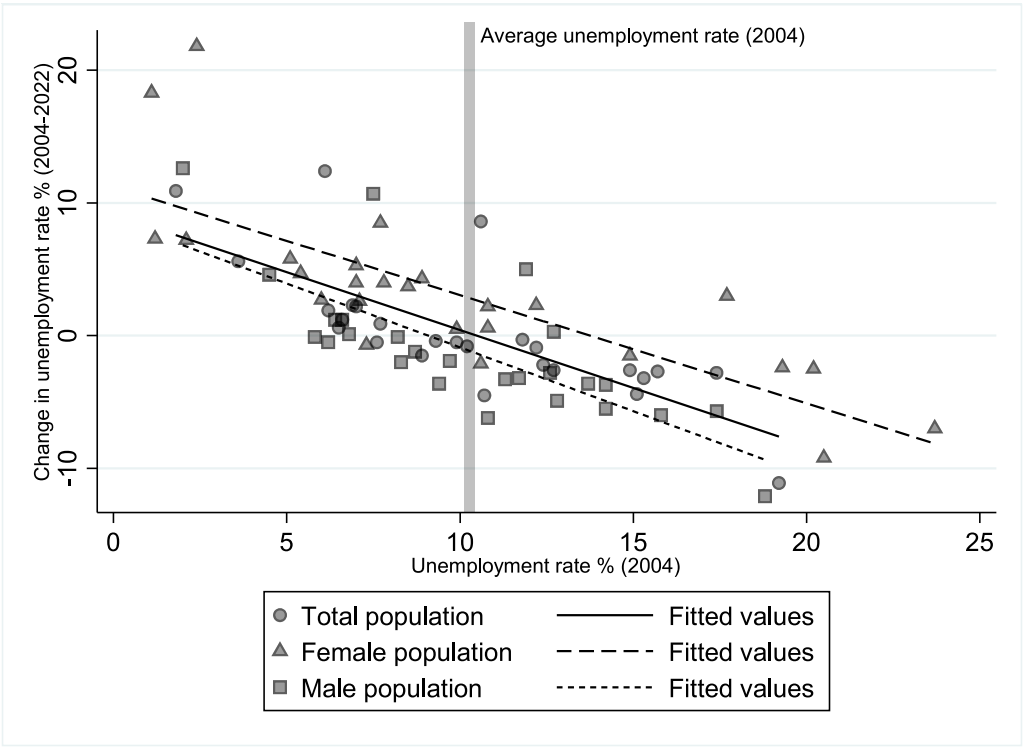

FIGURE 1 | Regional differences in unemployment rates. *Source:* Author's calculations by using Turkstat (2023a).

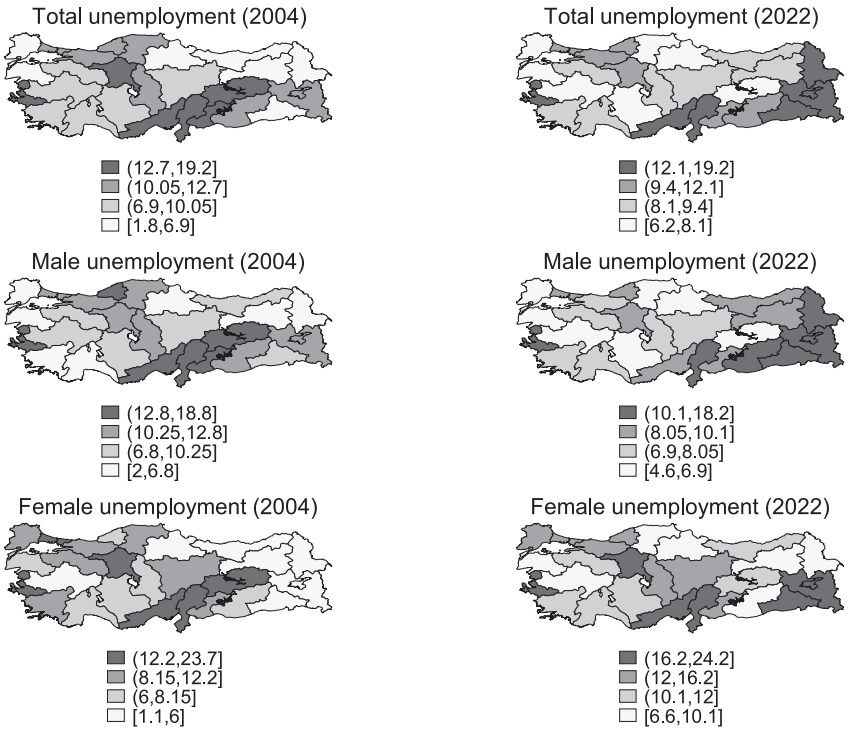

FIGURE 2 | Regional distribution of unemployment rate (%). *Source:* Turkstat (2023a).

check the club convergence by using the Philipps and Sul (2007) algorithm. Group-based log*(t)* test results are reported in Table 3. Initially, there are four convergence clubs. For each club we apply the log*(t)* test. Results show that the *t* statistic is either positive or higher than the critical value of −1.65. Therefore, we fail to reject the null hypothesis of convergence within each of the clubs considered. We further analyse the club merging and iteratively apply the log*(t)* test for the newly formed convergence clubs. Results indicate that only the second and third clubs can be merged. To sum-up, based on club merging we report three convergence clubs for the whole sample.

These findings show the clustering in unemployment rates. Revisiting Blanchard and Katz (1992, 1997) one can critically question unemployment convergence, as inequalities in unemployment persists at the local level. Our findings show that the main reason behind the regional unemployment differences is the formation of local convergence clubs. While for some regions unemployment rates decline, this does not decrease the unemployment disparities. Rather, regions cluster and form convergence clubs which create a more homogenous labour market within club borders. Revisiting the debates on how local labour markets can be instrumental for analysing the local resilience capacity (Di Caro and Fratesi (2018); Di Cataldo and Rodríguez-Pose (2017)) these findings remind the non-uniform distribution of resilience capacity at the local level.

We also examine the gender dimension (Table 4) and detect three and two convergence clubs for male and female population respectively. Overall, results point-out that despite lack of convergence in labour markets, there are club formations within the population. This polarisation matches with the prior concerns on heterogeneities within the population. Following Bock (2017) we find-out that gender based differences clearly influence the extent and the borders of club convergence.

We examine the distribution of club members in Table 5 and provide the periodical average unemployment rates. For the highest unemployment club (Club 1) unemployment rates are 14.63, 15.71 and 16.91% for total, male and female population respectively. For the second club female population has the highest unemployment rate of 10.71% followed by total and male populations. There are also non-converging regions which are not connected to any of convergence clubs for male and whole population. The unemployment rate for this non-converging region (TRC3) is high compared to its geographical surrounding.

We also plot the regional distribution of the convergence clubs in Figure 3. Notably, geographical evolution of the convergence clubs for the whole and male population are almost identical. This reflects the male bias in local labour markets. The most deprived regions are the south-eastern regions, reminding that unemployment problem has developmental origins related to the persistent spatial dualities. However, in the second club there is a combination of less developed and developed regions that also suffer from the unemployment problem. For instance, two economic centres TR10 (İstanbul) and TR51 (Ankara) belong to the second club for the whole and male population. This reminds that unemployment problem has links with the rapid urbanisation trends and the structural change observed in the developed, industrialised parts of the country (Doğruel and Doğruel 2018). Meanwhile, club convergence for the females is divergent compared to the rest of the population. This pattern indicates more polarisation as the duality and the deprivation of the isolated regions are more visible. For female population TR31 (İzmir) region also belongs to the first club with higher unemployment. This finding indicates that even in an urbanised and more developed region female population is deprived in terms of their labour market conditions.

These results indicate that club convergence in unemployment is dominated by the historical west-east duality and the unplanned, rapid growth in the urbanised western parts of the country. Moreover, these discussions validate the extreme polarisation in labour markets which is beyond the development level of Turkish regions. Given discussions on the evolution of regional disparities in Türkiye (see e.g. Doğruel and Doğruel, (2003); Aksoy, Taştan, and Kama (2019), Karahasan (2020a)) our findings validate the importance of observing the local labour markets and the unemployment problem. While regional convergence analyses draw a clear west-east duality our findings show that unemployment problem is also a concern for the urbanised and relatively

TABLE 2 | log *t* test results.

	log(*t*)	s.e.	*t*-stat
Total population	−1.475	(0.0119)	[−124.1726]
Male population	−1.7365	(0.0149)	[−116.6987]
Female population	−0.7303	(0.0165)	[−44.2116]

TABLE 3 | Club convergence classifications (total population).

		Club merging				
Initial clubs		**Club 1 + 2**	**Club 2 + 3**	**Club 3 + 4**	**Final clubs**	
Club 1	−0.8212	−0.4027			Club 1	−0.8212
	(1.1341)	(0.0170)				(1.1341)
	[−0.7241]	[−23.6471]				[−0.7241]
Club 2	0.5543		0.2040		Club 2	0.2040
	(0.1111)		(0.0697)			(0.0697)
	[4.9907]		[2.9255]			[2.9255]
Club 3	0.3412			−0.4034	Club 3	0.4874
	(0.0871)			(0.0255)		(0.0341)
	[3.9194]			[−15.8496]		[14.2912]
Club 4	0.4874					
	(0.0341)					
	[14.2912]					

Note: Standard errors in ( ), *t*-statistics in [ ]. Critical value for the *t*-statistic is −1.65.

TABLE 4 | Club convergence classifications (gender decomposition).

Panel A: Male population					
		Club merging			
Initial clubs		**Club 1 + 2**	**Club 2 + 3**	**Final clubs**	
Club 1	1.5070	−1.3355		Club 1	1.5070
	(2.3420)	(0.0186)			(2.3420)
	[0.6435]	[−71.8974]			[0.6435]
Club 2	−0.0539		−0.6741	Club 2	−0.0539
	(0.0389)		(0.0099)		(0.0389)
	[−1.3858]		[−68.0824]		[−1.3858]
Club 3	1.1962			Club 3	1.1962
	(0.0912)				(0.0912)
	[13.1106]				[13.1106]
Panel B: Female population					
		Club merging			
Initial clubs		**Club 1 + 2**		**Final clubs**	
Club 1	−0.0347	−0.7303		Club 1	−0.0347
	(0.0429)	(0.0165)			(0.0429)
	[−0.8101]	[−44.2116]			[−0.8101]
Club 2	0.2715			Club 2	0.2715
	(0.0471)				(0.0471)
	[5.7666]				[5.7666]

Note: Standard errors in ( ), *t*-statistics in [ ]. Critical value for the *t*-statistic is −1.65.

TABLE 5 | Final club formation and average unemployment rates.

		Number of regions	**Average unemployment rate % (2004–2022)**
Panel A: Total population			
Club 1	TRB2, TRC2	2	14.63
Club 2	TR10, TR31, TR41, TR42, TR51, TR61, TR62, TR63, TR71, TR72, TR81, TR83, TR90, TRA1, TRA2, TRC1	16	10.51
Club 3	TR21, TR22, TR32, TR33, TR52, TR82, TRB1	7	8.05
n/c	TRC3	1	20.73
Panel B: Male population			
Club 1	TRB2, TRC2	2	15.71
Club 2	TR10, TR31, TR32, TR41, TR42, TR51, TR61, TR62, TR63, TR71, TR72, TR81, TR90, TRA1, TRA2, TRC1	16	9.87
Club 3	TR21, TR22, TR33, TR52, TR82, TR83, TRB1	7	7.07
n/c	TRC3	1	20.27
Panel C: Female population			
Club 1	TR31, TR63, TRB2, TRC3	4	16.95
Club 2	TR10, TR21, TR22, TR32, TR33, TR41, TR42, TR51, TR52, TR61, TR62, TR71, TR72, TR81, TR82, TR83, TR90, TRA1, TRA2, TRB1, TRC1, TRC2	22	10.71

Note: n/c represents not converging regions.

developed western part of the country. As argued before, findings from Türkiye act vital for other developing countries with similar developmental problems.[8]

Finally, we consider the transition dynamics of convergence clubs (Figures 4, 5 and 6). Transition dynamics are almost identical for the total and male population. In the first club

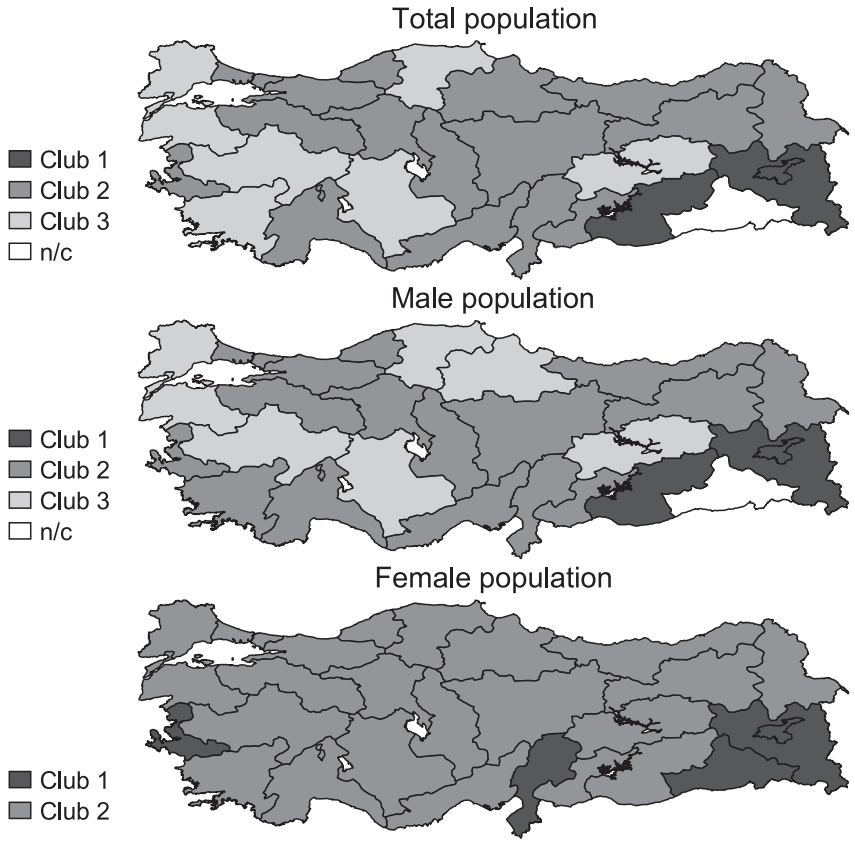

FIGURE 3 | Regional distribution of club convergence. n/c represents the not converging region. *Source:* Author's calculations based on Turkstat (2023a).

there are two regions with relatively lower convergence. However, for the second club there is clear tendency of common club behaviour. Those regions locating in the second club for male and total population realise a transition around a given margin of the country average. Finally, for the third club a set of regions with relatively lower unemployment rates convergence to each other. However, transition dynamics for female population is different. A number of regions with high unemployment rate cluster together (Club 1). Whereas remaining regions tend to converge to the country average again within a given band like the one we observe for the rest of the population. Overall, transition dynamics highlight relatively higher polarisation for the female population.

4.3 | Spatio-Temporal Dynamics of Club Convergence

The post-2000s in Türkiye represents one of the economic growth successes within developing countries (see e.g. Subaşat (2014) and Acar and Gultekin-Karakas (2016) for a critical review of the historical developments after the 2000s). However, reaching peak growth rates of 10% in 2004 and 2011 Turkish economy's growth performance starts to slow down after 2013. The long-term (1923–2023) GDP growth average of the Turkish economy is around 5% (potential GDP growth). During the pre-2013 Turkish GDP growth was continuously above this potential GDP growth only except for the global financial crises (2008–2009). However, after 2013 Turkish economy exceeded its long-term potential growth only for selected years with relatively a lower gap compared to the pre-2013 (see Supporting Information S1: Figure A2). Therefore, we use the year 2013 to split the post 2000s into two separate intervals.[9]

To check whether the changing economic conditions have effect on the club convergence in unemployment, we individually re-do the club convergence analyses for 2004–2013 and 2014–2022. Log*(t)* test results indicate lack of convergence for the whole sample regardless of the period and the gender decomposition (see Supporting Information S1: Table A2). However, after the merging procedures we end up with two clubs for the total population, three clubs for the male population and finally two clubs for the female population in both sub-periods of the sample (see Supporting Information S1: Tables A3 and A4).

Albeit clustering seems similar, there are differences regarding the composition and spatial evolution of the convergence clubs. Findings in Table 6 show that unemployment rate in the first sub-period is lower compared to the overall sample. Remarkably, unemployment rates increase for the second sub-period and exceed the first and the whole period regardless of the gender. Only exceptions are the convergence Club 3 for the male population and the remaining non-converging regions. Moreover, spatial evolution of the convergence clubs signals rising polarisation in the labour markets (Figure 7). Sub-periods witness different clustering compared to the whole sample. Number of regions in each convergence club is relatively balanced and regions are almost equally distributed across the clubs

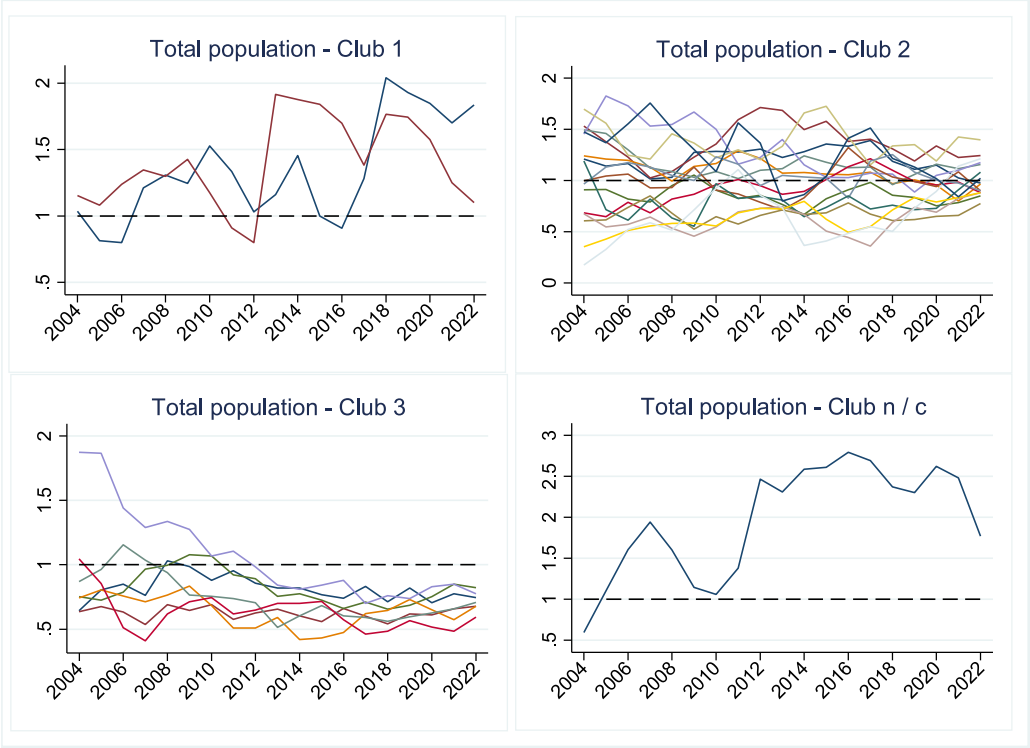

FIGURE 4 | Transition dynamics for total population (h_t). n/c represents the not converging regions. *Source:* Author's calculations based on Turkstat (2023a).

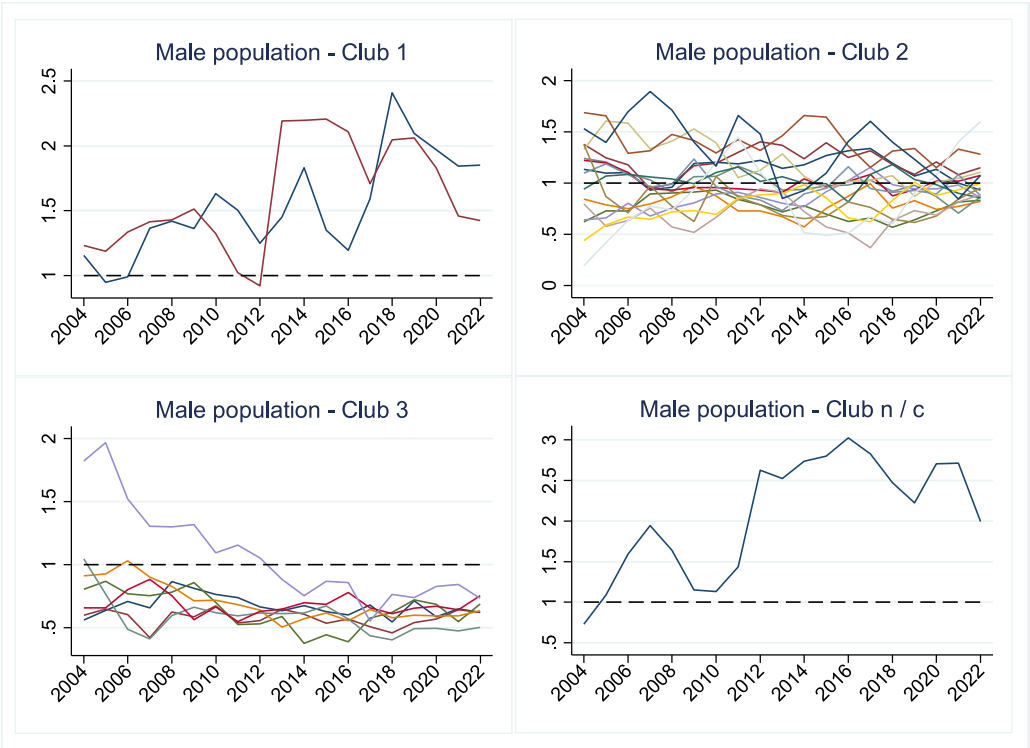

FIGURE 5 | Transition dynamics for male population (h_t). n/c represents the not converging regions. *Source:* Author's calculations based on Turkstat (2023a).

during the first sub-period. It is the combination of underdeveloped south-east and some developed west regions that constitute the highest convergence in the 2004–2013 period. This reminds that during the early 2000s unemployment rates are lower and a dual labour market structure is created. However, number of regions belonging to high unemployment

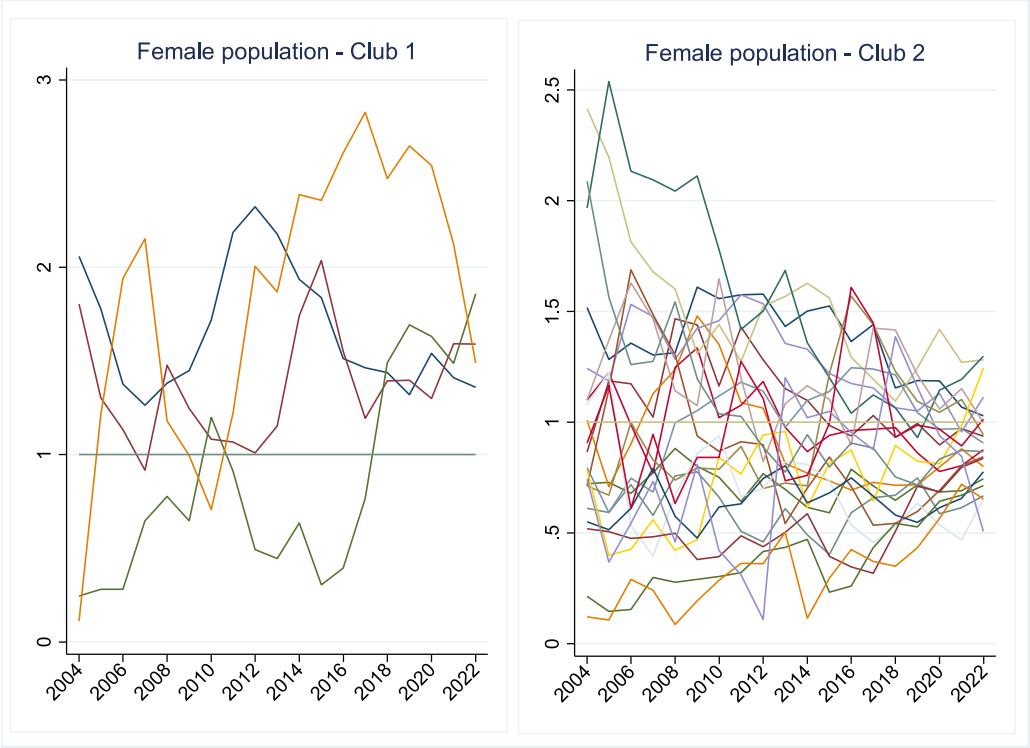

FIGURE 6 | Transition dynamics for female population (h_t). *Source:* Author's calculations based on Turkstat (2023a).

cluster decreases in the second half of the 2000s. These regions cluster within the least developed isolated south-eastern geography with higher unemployment compared to the rest of the country. We argue that this reshuffling is a movement from a dual structure towards more polarisation.

A second dimension relates to the spatial spillovers.[10] Prior evidence highlights the spatial spillovers in unemployment rates (Filiztekin 2009). Moreover, Gezici and Hewings (2004), Karahasan (2020a) underline the persistent spatial spillovers in regional prosperity. Recently Karahasan (2020b), Cutrini and Mendez (2023), Ursavaş and Mendez (2023) show the importance of incorporating spatiality in club convergence. To check the spatial clustering of unemployment we test the existence of spatial auto-correlation by using the Moran's I test statistics.[11] Results show the existence of spatial auto-correlation in unemployment rates for total and male population (see Supporting Information S1: Table A5). Results for female population show relatively less spatial dependence. However, based on the clustering patterns in Figure 2 we also apply the spatial extensions for female population.

First, we compute the spatial lag of unemployment rate for each NUTS-2 regions. Spatial lag corresponds to the spatially weighted unemployment rate. The main idea for using the spatial lag of regional unemployment is to understand the accurate extent of unemployment deprivation. Rather than focusing on the unemployment rate of a certain region, focusing on the spatial hinterland will describe the accurate extent of local labour markets. This links with the remarks of Combes, Duranton, and Gobillon (2008), Overmann and Xu (2022) on the spatial clustering and spillovers observed in local labour markets. We argue that analysing the club convergence by only relying on the regions' administrative borders hides the true unemployment problem in the local labour markets. As regions are spatially connected and local labour markets integrate with their spatial hinterland unemployment problem detected in one region will create an inevitable spatial inertia within proximity. Therefore, the true extent of unemployment problem will be better understood if spatial lag of unemployment rate is included.

We use the spatially weighted unemployment rate and apply the club convergence analyses. Log*(t)* test results indicate lack of convergence for the whole sample for our spatial extension (see Supporting Information S1: Tables A2). However, convergence classification and club-based log*(t)* test results remind the probability of convergence within sub-groups of the spatially augmented sample. In Supporting Information S1: Table A6 we report three, four and two convergence clubs for total, male and female population.

Next, we examine the composition and geographical evolution of spatially augmented convergence clubs (Table 7). Findings show that unemployment rates expand once spatial proximity is considered. For each gender specification the average unemployment rate is higher compared to the initial findings. Remarkably, highest unemployment rate in Club 1 jumps to 25.59, 26,79 and 27.21 for total, male and female population respectively. Meanwhile, clubs with the lowest unemployment witness an average unemployment rate of 17.7, 16.24 and 23.08 for the same gender decomposition. These levels are higher compared to the unemployment rates from earlier analyses which disregard the impact of spatial proximity. In Figure 8, we

TABLE 6 | Final club formation and average unemployment rates—Temporal dynamics.

		Number of regions	Average unemployment rate % (2004–2013)			Number of regions	Average unemployment rate % (2014–2022)
Panel A: Total population (2004–2013)				Panel D: Total population (2014–2022)			
Club 1	TR10, TR21, TR31, TR32, TR42, TR61, TR62, TR63, TR72, TRA2, TRB2, TRC1, TRC2	13	11.59	Club 1	TRA2, TRB2, TRC3	3	17.32
Club 2	TR22, TR33, TR41, TR51, TR52, TR71, TR81, TR82, TR83, TR90, TRA1, TRB1	12	8.39	Club 2	TR10, TR21, TR22, TR31, TR32, TR33, TR41, TR42, TR51, TR52, TR61, TR62, TR63, TR71, TR72, TR81, TR83, TR90, TRA1, TRC1, TRC2	21	10.31
n/c	TRC3	1	15.22	n/c	TR82, TRC2	2	7.4
Panel B: Male population (2004–2013)				Panel E: Male population (2014–2022)			
Club 1	TR10, TR31, TR61, TR62, TR63, TR72, TRA1, TRA2, TRB2, TRC1, TRC2	11	11.6	Club 1	TRA2, TRB2, TRC3	3	17.39
Club 2	TR21, TR22, TR32, TR41, TR42, TR51, TR71, TR81, TR83, TR90, TRB1	11	8.84	Club 2	TR10, TR31, TR32, TR33, TR41, TR42, TR51, TR61, TR62, TR63, TR71, TR72, TR81, TR83, TR90, TRA1, TRB1, TRC1	18	9.01
Club 3	TR33, TR52, TR82	3	7.29	Club 3	TR21, TR22, TR52	3	5.9
n/c	TRC3	1	15.49	n/c	TR82, TRC2	2	11.81
Panel C: Female population (2004-2013)				Panel F: Female population (2014–2022)			
Club 1	TR10, TR21, TR32, TR41, TR42, TR51, TR61, TR62, TR63, TR72, TR81, TRB2, TRC1, TRC3	14	12.43	Club 1	TR31, TR63, TR81, TRB2, TRC3	5	19.59
Club 2	TR22, TR33, TR52, TR71, TR82, TR83, TR90, TRA1, TRA2, TRB1, TRC2	11	7.06	Club 2	TR10, TR21, TR22, TR32, TR33, TR41, TR42, TR51, TR52, TR61, TR62, TR71, TR72, TR82, TR83, TR90, TRA1, TRA2, TRB1, TRC1, TRC2	21	11.56
n/c	TR31	1	18.21				

Note: n/c represents not converging regions.

examine the geographical distribution of clubs. Although, the number of convergence clubs are higher and there are minor differences in the composition of the clubs, geographical separation is comparable with the baseline findings. This reminds that, including the spatial spillovers increases the level of local deprivation but has relatively less impact on the geographical distribution of the club formation. This shows the inertia in the spatial polarisation of Turkish labour markets.

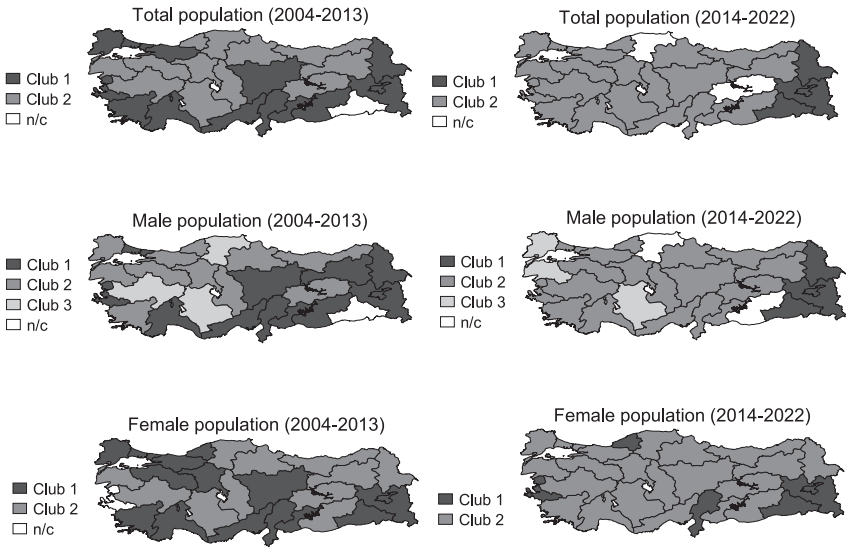

FIGURE 7 | Regional distribution of club convergence—Temporal dynamics. n/c represents the not converging region. *Source:* Author's calculations based on Turkstat (2023a).

TABLE 7 | Final club formation and average unemployment rates—Spatial dynamics.

		Number of regions	Average unemployment rate % (2004–2022)
Panel A: Total population			
Club 1	TRB2, TRC2	2	25.95
Club 2	TR10, TR22, TR31, TR32, TR41, TR42, TR51, TR61, TR62, TR63, TR71, TR72, TR81, TR83, TR90, TRA1, TRA2, TRB1, TRC1	19	20.72
Club 3	TR33, TR52	2	17.7
n/c	TR21, TR82, TRC3	3	22.4
Panel B: Male population			
Club 1	TRB2, TRC2	2	26.79
Club 2	TR10, TR31, TR51, TR61, TR62, TR63, TR71, TR72, TR90, TRA1, TRA2, TRB1, TRC1	13	20.47
Club 3	TR21, TR22, TR32, TR41, TR42, TR81, TR83	7	16.87
Club 4	TR33, TR52	2	16.24
n/c	TR82, TRC3	2	23.24
Panel C: Female population			
Club 1	TRB2, TRC3	2	27.21
Club 2	TR10, TR21, TR22, TR31, TR32, TR33, TR41, TR42, TR51, TR52, TR61, TR62, TR63, TR71, TR72, TR81, TR82, TR83, TR90, TRA1, TRA2, TRB1, TRC1, TRC2	24	23.08

Note: n/c represents not converging region.

We argue that using spatially dependent variables (e.g. unemployment rate and/or spatial lag of unemployment rate) does not affect the club convergence approach used in this paper. The approach offered by Phillips and Sul (2007) does not target any inferential analyses, rather aims to group regions into sub-clusters by tracing their transitions towards individual long-term equilibriums. Therefore, any spatiality detected in the benchmark analyses (with regional unemployment rates) and the additional spatial analyses (with the spatial lag of unemployment) will not alter the analyses carried out in the paper.[12]

4.4 | General Characteristics of the Convergence Clubs

Apart from the club formation, examination of factors that cause clustering in certain convergence clubs is important.

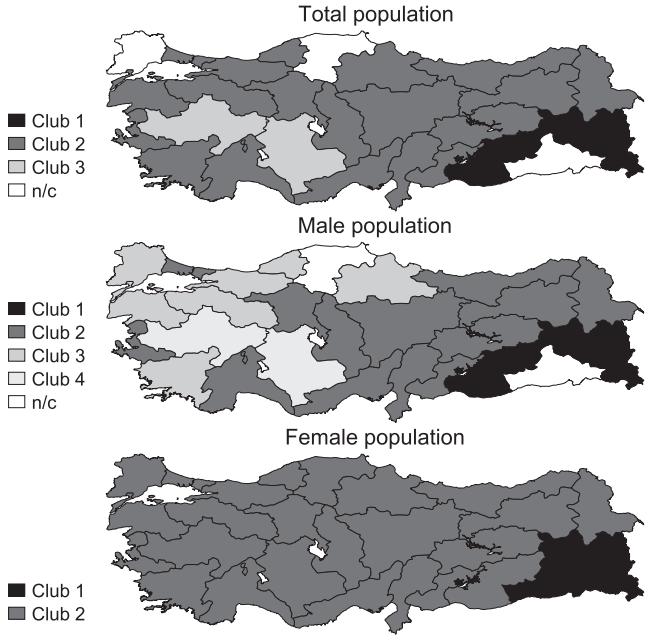

FIGURE 8 | Regional distribution of club convergence—Spatial dynamics. n/c represents the not converging region. *Source:* Author's calculations based on Turkstat (2023a).

Although this has not been an objective in this paper visualising the general characteristics of convergence clubs can be a practical guide for understanding the descriptive background of unemployment polarisation.

It is important to note that, studies investigating the factors causing club convergence use logit type of econometric models. These models examine the impact of local conditions on the likelihood for a region to be a member of a certain convergence club. The main limitation of the approach for our research is the low observation number especially for the marginalised convergence clubs. For instance, our grouping for the baseline analyses (Table 5) shows that for the total population there are only 2, 16 and 7 regions in the convergence clubs 1, 2 and 3 respectively (one additional regions as non-convergent). Number of regions in the corresponding club is 2, 16 and 7 for male population (one additional regions as non-convergent) and 4 and 22 for the female population. We acknowledge that there is no universal rule for deciding the sufficient observation number. However, we argue that estimating an econometric model in our setup to assess the local conditions' impact on the likelihood of belonging to certain clubs will be inaccurate and inappropriate for understanding the determinants of unemployment.

Therefore, we prefer not to follow an econometric approach for understanding the main factors causing club convergence. Instead, we observe descriptively the main characteristics of the convergence clubs for the baseline analyses. We examine regional per capita GDP (in USD), sectoral composition of the labour force (agriculture, services and industry employment as % of regional employment), human capital development (measured by share of university graduates and average years of schooling), innovation capacity (patent applications and registrations per 100,000 population), public inclusion in local economies (total public expenditures as a % of regional GDP), extent of local entrepreneurship (new firms per 100,000 population) and finally openness (export plus imports as a % of regional GDP).[13] For each indicator we provide the sample average of 2004–2022 (Table 8). Due to data coverage education, employment and trade figures are averaged for the 2008–2022, 2007–2022 and 2013–2022 periods respectively.[14]

Our descriptive exercises validate previous concerns on regional polarisation. Regions clustered within the high unemployment club (Club 1) lag behind the other convergence clubs in all of the investigated indicator. Overall, Club 1 consists of poor regions hosting more agricultural employment, with low levels of human capital development. Remarkably, innovation capacity of this club (patent applications and registrations) is extremely low. Moreover, convergence Club 1 hosts relatively lower new firms and trade openness is relatively low compared to the rest of the country. Finally, we report higher public inclusion in this high unemployment club which matches with the policy approach of transferring higher public sources towards historically less developed regions. This pattern is mostly consistent once male and female population is also considered. The only exception is for the trade openness comparison carried out for the female population, where share of openness of the two clubs are close to each other. We argue that this originates from the high female unemployment rate detected for developed and more urbanised regions.

This finding is also reflected once the remaining convergence clubs are investigated. The second convergence clubs (Club 2) hosts regions with better economic and social conditions compared to the convergence clubs with the least unemployment problem (Club 3). This relates to the fact that urbanised and relatively more developed regions in Türkiye suffer from the unemployment problem. This matches with our previous remarks on the inclusion of selected developed regions in higher unemployment clusters. Our findings confirm the very well-known east and west duality as eastern regions are dominantly composed of regions suffering from high unemployment problem. Our findings also show that even in developed and urbanised regions unemployment problem persists reminding the potential asymmetric development trajectories of the Turkish regions.[15]

5 | Conclusion

Country specific cases show that local economic growth does not always create more jobs and decrease the unemployment problem. While there is rising need for policy action to deal with unemployment problem club formation in local labour markets is relatively less examined which to our view is a threat for the effectiveness of economic and social cohesion. In this study we investigate a spatially unequal country, Türkiye and examine the formation of convergence clubs in unemployment rates during an era of rapid change and transformation.

Our analyses show the existence of convergence clubs in Türkiye. The most deprived club with the highest unemployment figures is mostly composed of the least developed and isolated south-eastern regions. This validates the underdevelopment

TABLE 8 | Main characteristics of convergence clubs (Benchmark analysis).

	PC GDP (in USD)	Agr. emp (% tot.)	Ind. emp. (% tot.)	Ser. emp. (% tot.)	Uni. share (% tot)	Avrg. Yrs.	PC pat. app.	PC pet reg.	Public exp.	PC new firms	Trade (% GDP)
Panel A: Total population											
Club 1	4020	0.368	0.192	0.440	0.087	6.472	0.572	0.055	0.263	36.060	0.046
Club 2	8942	0.260	0.242	0.499	0.140	7.973	4.735	1.171	0.124	70.175	0.334
Club 3	8444	0.317	0.238	0.445	0.129	7.818	3.737	0.832	0.122	49.894	0.160
n/c	4750	0.173	0.216	0.612	0.093	6.761	0.518	0.056	0.218	41.190	0.185
Panel B: Male population											
Club 1	4020	0.368	0.192	0.440	0.087	6.472	0.572	0.055	0.263	36.060	0.046
Club 2	9099	0.252	0.244	0.503	0.141	8.006	4.755	1.176	0.120	72.462	0.336
Club 3	8085	0.334	0.232	0.434	0.126	7.743	3.692	0.821	0.132	44.668	0.155
n/c	4750	0.173	0.216	0.612	0.093	6.761	0.518	0.056	0.218	41.190	0.185
Panel C: Female population											
Club 1	6621	0.231	0.245	0.524	0.118	7.377	2.125	0.433	0.181	53.663	0.287
Club 2	8568	0.289	0.234	0.477	0.134	7.840	4.322	1.045	0.130	62.306	0.254

Note: Employment figures are percentage of the total employment, university share is the share of university graduates in population (+15), per capita patent applications and registrations are per 100K population, public expenditure is percentage of local GDP, per capita new firms and closers are per 100K population, trade represents the total export and import as a percentage of local GDP.

dimension of the unemployment problem. However, there are also more urbanised western regions that belong to the high unemployment clusters. This finding shows that unemployment problem is not only a concern of less developed regions, but also a problem for the highly growing urban centres. We also highlight that female population is geographically more polarised and suffers more from higher unemployment. Specifically, club formation of the female population shows higher deprivation for the remote south-eastern regions. These preliminary findings show that unlike the expectations on homogenisation in unemployment rates (Katz and Blanchard 1992) there is no global convergence across the territory of Türkiye. Rather there are distinct convergence clubs confirming the concerns on more marginalisation.

Findings of this study show sizeable marginalisation in local labour markets. Remarkably, convergence clubs with high unemployment rates have certain regional characteristics. Regions in the high unemployment cluster tend to have lower income, higher agricultural employment, lower human capital development and innovation capacity, depressed entrepreneurship, high public inclusion and lower integration with rest of the world. These findings also contain important clues on the resilience capacity of highly unemployed regions. Revisiting the early remarks on how strong local labour markets increase the regional absorption capacity during economic turmoil, our results must be perceived as an alert for those regions with high unemployment rates and therefore with lower resilience. Additionally, even though we detect high public inclusion in the high unemployment clusters impact of public is insufficient to create what is called as the sheltered economies in relatively less developed locations. This gives additional concerns on the effectiveness of public inclusion and promotes more policy discussion to manage the public inclusion to create a more sheltered economy especially for the lagging regions.

We also carry-out additional exercises for the spatio-temporal dimension of club formation. Polarisation of unemployment gets stronger after 2013 as the source of the unemployment problem shifts towards the far east part of the country. This validates that the post 2000s is divided into two distinct phases. During the pre-2013 unemployment rates are relatively lower and there is less polarisation in the local labour markets. This can be traced by comparing the number of clubs and the number of regions within the convergence clubs in both sub-periods of our sample. However, post-2013 witness rising unemployment rates and more polarisation in local labour markets.

We also consider the spatial spillovers. Our findings show that if the spatial proximity is disregarded the true impact of local unemployment rates are under-rated. Therefore, the presence of spatiality in local labour markets (Combes, Duranton, and Gobillon 2008) are also central for understanding the accurate extent of unemployment. Regions that are close to each other create negative externalities which expand the true impact of unemployment problem. However, incorporating the spatial dimension does not affect the geographical distribution of club formation.

Our findings propose vital guidance for the design of territorial and labour market policies. First, examining the formation of convergence clubs is an ideal way to understand the extent of unemployment problem. Given the spatially dependent local life our findings give clues on the importance of analysing the local clusters. These clusters which are defined as the convergence clubs contain hints on the borders of effective local policies. We

believe policies which are designed individually for the convergence clubs will be more effective compared to common and spatially blind centralised policies that targets the unemployment problem. Second, our findings show that regions are not independent islands with lack of local spatial connections. Besides, our findings show that once we control for the effect of unemployment in proximity the actual scale of unemployment problem expands within the convergence clusters.

Finally, our findings show the asymmetry between economic progress and unemployment problem. Although 2000s is regarded as a growth era for Türkiye regional adjustments seems limited as there is rising polarisation in the labour markets. This can be partially linked with the slow-down of economic growth and rising macroeconomic uncertainties during the post-2000s. Alternatively, this can relate to the expanding separation between the winners and losers of the rapid change in the Turkish economy. In developing economies like Türkiye, even macroeconomic outlook is positive reflections on the local labour markets can be asymmetric. This reminds the importance of considering the labour market outcomes of economic growth strategies. Without proper analyses of the local job creation potential of economic growth, growth experiences in countries like Türkiye might end up with evolution of local unemployment clusters.

Ethics Statement

The author has nothing to report.

Conflicts of Interest

The author declares no conflicts of interest.

Data Availability Statement

Data derived from public domain resources. Regional unemployment data is publicly available and can be obtained from Turkish Statistical Institute (TurkStat 2023a) (TurkStat [2023a], Turkish Statistical Institute, Regional Labour Force Statistics https://biruni.tuik.gov.tr/medas/?kn=102&locale=tr). Other regional data sets are also publicly available: MFT (2023), Ministry of Treasury and Finance, Regional Public Spending Statistics. TOBB (2023), The Union of Chambers and Commodity Exchanges of Türkiye, Regional New Firms Start-up Statistics. TurkStat (2023b). Turkish Statistical Institute, Regional Statistics. Turk Patent (2023), Turkish Patent Institute, Provincial Patent Statistics.

Endnotes

[1] We would like to thank one of the anonymous reviewers for pointing-out the importance local labour markets as valid candidates to understand the resilience capacity of regions.

[2] See Tomal (2023) for a review of the studies using the Phillips and Sul (2007) approach.

[3] Tyrowicz and Wójcik (2010) test the beta convergence hypothesis for the unemployment patterns in Czech Republic, Poland and Slovakia with evidence for divergence. Tyrowicz and Wójcik (2011) show that labour market convergence in Poland is limited even once a non-stochastic convergence model is constructed. Beyer and Stemmer (2016) show that convergence and polarisation can occur at the same time for the EU regions. Meanwhile, Bayer and Jüessen (2007) apply the stochastic convergence model for the German regions and find limited evidence on convergence.

[4] Phillips and Sul (2007) suggest using 0.3.

[5] See the Online Appendix (OA), Section OA1 for the NUTS-2 regions (Supporting Information S1: Table A1 and Figure A1).

[6] Additional analyses for spatio-temporal patterns will be summarised in sub-section 4.3. Supportive work is also provided in the OA (Section OA-2).

[7] As suggested by Phillips and Sul (2007), Du (2017), we remove the cyclical component in the unemployment series by applying the Hodrick-Prescott filter (HPF). Following Hamilton (2018) we carry-out additional robustness checks using alternative filters and provide results with detailed discussions in the OA (Section OA-3).

[8] See Rey and Janikas (2005) for an overview of regional disparities in different countries.

[9] We further investigate different time intervals to check how local labour markets adjust to other macroeconomic turmoils (see OA, Section OA-3).

[10] An alternative is to investigate the inertia in the unemployment figures. We provide additional analyses by using the time-wise autocorrelation and how it affects the club convergence in the OA (Subsection OA-3).

[11] Moran's I test statistics is described as follows: $\frac{n}{s}\frac{\sum_{i=1}^{n}\sum_{j=1}^{n} w_{ij}(x_i-\bar{x})(x_j-\bar{x})}{\sum_{i=1}^{n}(x_i-\bar{x})^2}$, where w is the weight matrix, n is the number of regions, s is the summation of all elements in the weight matrix. The null hypothesis is spatially random distribution. We use a contiguity weight matrix that assigns 1 if regions share a common border and 0 otherwise. There are other alternatives as inverse distance, threshold distance and kth nearest neighbour weight matrices. Results from these weight matrices are similar and available upon request.

[12] Incorporating a spatial data generation procedure within the factor model of the Phillips and Sul (2007) model is an important future research area.

[13] We skip the theoretical discussions for the factors causing unemployment. See Section 2 for details.

[14] Regional GDP, employment and openness data sets are collected from TurkStat (2023a, 2023b). Data for patent applications and registrations are provided by Turkish Patent Institute (Turk Patent, 2023). New firms data is collected from The Union of Chambers and Commodity Exchanges of Türkiye (TOBB, 2023). Finally, data for public expenditures is from Ministry of Treasury and Finance (MFT, 2023).

[15] We also trace the evolution of regional characteristics at the club level. Results and related discussions are provided in the OA (Section OA-4).

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Supporting Information

Additional supporting information can be found online in the Supporting Information section.