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Spatial inequality, regional growth, and economic geography

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Abstract

This paper explores the patterns of spatial income disparities within countries throughout the 20th Century. Following World War II, regional income gaps initially narrowed; however, the rate of convergence has slowed in recent decades, with regional divergence evident in some countries. Despite narrowing income gaps, the incomplete nature of regional income convergence has led to persistent income gaps across the regions in our sample. We synthesise recent contributions seeking to explain these patterns, with an emphasis on insights from quantitative economic geography and macroeconomics.

Key words: Economic geography, growth, inequality.

JEL classification: F62, R110, O110.

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1 Introduction

Spatial disparities within countries are both ubiquitous and persistent. While there are widespread concerns about the potential detrimental effects of uneven regional growth, there is less consensus about the key drivers of regional income differences, how they evolve, or why they endure. In this chapter, we synthesise the evidence for these patterns. Drawing from the literature on quantitative economic geography and macroeconomics, we highlight key contributions that shed light on underlying mechanisms.

To support our discussion, we compile a dataset of regional income for 287 regions across 18 developed countries. We define regions as the first administrative division below the national level. In Section 2, we describe the construction of this dataset in detail. We combine this dataset with other sources to document a set of empirical patterns that frame our review of the literature (see also Barro and Sala-i Martin, 1992; Sala-i Martin, 1996*a*; Kim, 1998; Mitchener and McLean, 1999; Rosés and Wolf, 2021).

Our review is structured around three stylised facts. First, while there have been significant spatial income gaps within countries throughout the sample period, these gaps appear to have declined over time. Catch-up growth in poorer regions between 1950 and 1980 is particularly important for explaining regional convergence in many countries. Second, the rate of convergence has slowed since the 1980s. Although growth has declined in most countries in the sample, it

fell relatively less in high-density regions. Specifically, regions with the highest density of economic activity within each country experienced a smaller reduction in their growth rates, which in turn lowered the rate of convergence. Finally, the incomplete nature of the convergence process across many countries results in high degrees of persistence in regional incomes. As a result, despite narrowing income gaps, the relative rankings of regional incomes are fairly stable in our sample.

To understand these patterns, Section 3 synthesises key insights from the literature on factors underpinning convergence, divergence, and persistence. This section begins with a discussion of the drivers of regional income disparities, including human capital, institutions, and geographical fundamentals. We then explore the literature on regional convergence, which emphasises the role of factor mobility, technology diffusion, and structural transformation in narrowing spatial income gaps. Our discussion shifts to an analysis of the recent deceleration in regional convergence, with a focus on the impact of skill-biased technical change, globalisation, and the proliferation of information and communication technologies (ICT). We also address the persistence of regional income gaps, highlighting the importance of location fundamentals and agglomeration economies, which can lead to multiple spatial equilibria. This sets the stage for a discussion of newer contributions in the field, which capture the interplay between aggregate economic growth and changes in the spatial distribution of economic activity. Substantial progress has been made in building models that incorporate

realistic geographies and rich spatial heterogeneity, providing new insights into the drivers of regional convergence, divergence, and persistence.

Finally, against the backdrop of slowing convergence, Section 4 closes this chapter with an overview of policies aimed at mitigating regional disparities. We review the evidence on the impact of these policies, focusing on large-scale programmes that aimed to deliver regional convergence or transformational change. An increasing concern in high-income countries about economic and social outcomes in 'left behind places' and resulting political discontent among residents, has brought 'place-based' policies to the fore (OECD, 2023). The descriptive picture with which we opened this chapter highlights the persistent nature of regional income gaps, illustrating the innate strength of economic forces that policy interventions seek to influence or overcome, and the magnitude of the task required were policy to be successful in narrowing spatial disparities.

2 Motivating Evidence on Regional Income Gaps and Convergence

2.1 Data

To support our review of the literature, we construct a dataset of GDP per capita for 18 high-income countries.[1] For each country we use data for the first administrative division below the national level, e.g. NUTS2 for European

[1]The dataset includes Austria, Belgium, Denmark, Finland, France, Germany, Italy, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, the United Kingdom, the United States, Japan, Canada, and Australia.

countries, states for the United States, and prefectures for the case of Japan. We henceforth refer to these as regions. In recent years, there have been several efforts to construct harmonised cross-country datasets of regional economic activity with large spatial and temporal coverage (see e.g. Rosés and Wolf, 2018*b*; Wenz et al., 2023). Our analysis leverages this work to construct a panel spanning a total of 287 regions across 18 countries, representing approximately 67% of global GDP and 15% of the worldwide population in the year 2000 (Bolt and Van Zanden, 2024). In the rest of this section, we discuss the data sources in more detail.

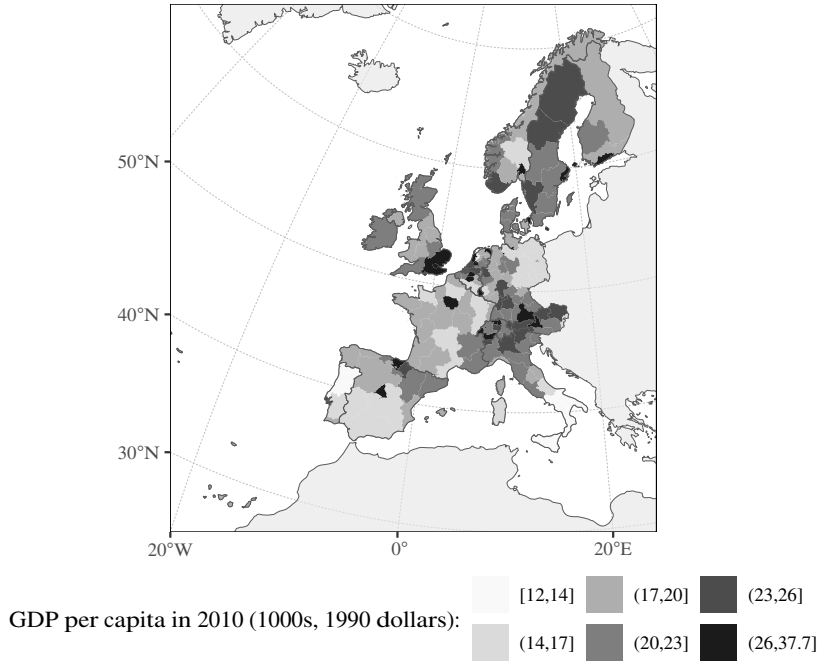

Figure 1. This figure depicts GDP per capita in 1990 dollars at the NUTS2 level for the year 2010. PPP adjustment at the country level. Source: Rosés and Wolf (2020).

For Western Europe, we use GDP and population data from Rosés and Wolf (2020), which covers 173 regions across 16 Western European countries at the

NUTS2 level (see Figure 1).[2] Our analysis uses data for the years 1900, 1950, 1980, and 2010. In Rosés and Wolf (2020), regional GDP is constructed using various sources, expressed at purchasing power parity in 1990 international dollars. The price deflators are at the national level. For periods preceding the publication of national accounts, regional GDP per capita is imputed using the Geary-Stark method (Geary and Stark, 2002). We omit Luxembourg and Ireland from the analysis since they only contain one region in the dataset.

For regions outside Western Europe with the exception of the United States, we use data from the *Global Data Set of Reported Sub-National Economic Output* (DOSE) (Wenz et al., 2023), which is assembled from various sources such as statistical agencies, yearbooks, and the academic literature. This dataset covers subnational regions (one level below the national level) across a broad range of countries from the 1960s. Regional GDP per capita is measured using data on gross regional product per capita in local 2015 prices and converted to US dollars using 2015 market exchange rates. The data is available at an annual frequency, and we average GDP per capita by decade to remove high-frequency variation. Wenz et al. (2023) does not impute any data, resulting in a smaller temporal coverage for the regions outside western Europe and the United States.

[2]See Rosés and Wolf (2018*a*) for details on the construction of the data. Many papers have conducted country or region-specific analyses. See for example Rosés and Wolf (2018*a*) for European countries since 1900, Barro and Sala-i Martin (1992); Kim (1998); Mitchener and McLean (1999) for US states, and Sala-i Martin (1996*a*) for Japanese prefectures.

Regional data on GDP for the United States is based on Klein (2018) and Bolt and Van Zanden (2024). For each state, Klein (2018) provides data on the ratio of total personal income per capita relative to total personal income per capita at the national level. Following their methodology, we use each state's share of personal income and US GDP data from Bolt and Van Zanden (2024) to compute state-level GDP by decade since 1900, excluding Alaska, Hawaii, and the District of Columbia from the analysis. Data on total population by state is drawn from Manson et al. (2022). For territories incorporated as states after 1900 (Arizona, Oklahoma, and New Mexico), we assign population data from the corresponding territories to construct a balanced panel.

We combine the data on regional GDP per capita with information on location fundamentals using a range of sources that we briefly summarise here. To calculate regional location fundamentals, we match Rosés and Wolf (2020) with a shapefile at the NUTS2 level provided by the authors and the data from DOSE and Klein (2018) with shapefiles from GADM (2024). These shapefiles allow us to match the regions to location fundamentals, such as potential caloric yield (Galor and Özak, 2015, 2016), average elevation and terrain ruggedness (Amante and Eakins, 2009), proximity to major rivers, and distance to coastlines using data from Natural Earth. As a proxy for a location's market access, we calculate the average inverse distance to all other regions.[3] Lastly, in the cases where we make

[3]Specifically, $\text{mp}_j = \sum_{i=1}^{R} d_{ji}^{-1}$ where R denotes the number of regions. For Western Europe R denotes all regions in Western Europe. For the remaining countries R denotes

comparisons to rates of convergence of GDP per capita at the national level, we use data from Bolt and Van Zanden (2024).

Finally, we point out two important limitations of the analysis in this paper. First, since the subsequent analysis primarily focuses on within-country regional comparisons, accurately accounting for cross-country price differences is less critical. However, the lack of regional price deflators remains a constraint. Without such adjustments, differences in regional GDP per capita differences may overstate real income disparities due to higher non-tradable prices in wealthier regions. Nonetheless, differences in GDP per capita likely correlate with living standards across regions, supporting the relevance of our findings (see e.g. Gennaioli et al., 2014). Second, due to different temporal coverage across various countries, we focus on slightly different samples in the different parts of the subsequent analysis. We return to this issue in each subsection below.

2.2 *The Size of Regional Income Differences*

We begin by examining income disparities among regions within each country. For each country, we calculate the ratio of GDP per capita in the highest-income region to that in the lowest-income region, focusing on the decades 1980 and 2010.[4]

The results, shown in Figure 2, reveal substantial variation in GDP per capita

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all the regions within the country.

[4]We omit Canada in this analysis since data on regional GDP in 1980 is missing.

across regions. In much of our sample, the GDP per capita in the region with the highest income is roughly double that in the region with the lowest. Across the full sample, this ratio ranges from 1.2 to almost 2.87, which is comparable to income differences *between* countries. For instance, in our sample, Norway, the country with the highest GDP per capita in 2015, has around 3.3 times higher GDP per capita (adjusted for purchasing power) than the poorest country, Portugal. While the magnitudes are sizeable, they should be interpreted as upper bounds since they are not adjusted for regional price differences.

How has this ratio evolved over time? Among countries with a long time-series of data, Japan exhibited the largest historical disparity, with the richest region's GDP per capita being 2.87 times higher than that of the poorest in 2010, up from 2.85 in 1980. Across the entire sample, the average ratio increased from 1.91 in 1980 to 1.99 in 2010. This suggests a widening income gap between regions over recent decades. Next, we examine how regional income disparities have evolved over time in greater detail.

2.3 Empirical Framework

To explore the evolution of regional income gaps over time, we examine whether regions with low GDP per capita tend to grow faster than regions with high levels of GDP per capita on average, a process that is known as *β-convergence* (see e.g. Durlauf, Johnson and Temple, 2005). This concept has been studied extensively, notably by Barro and Sala-i Martin (1992), which documents convergence across

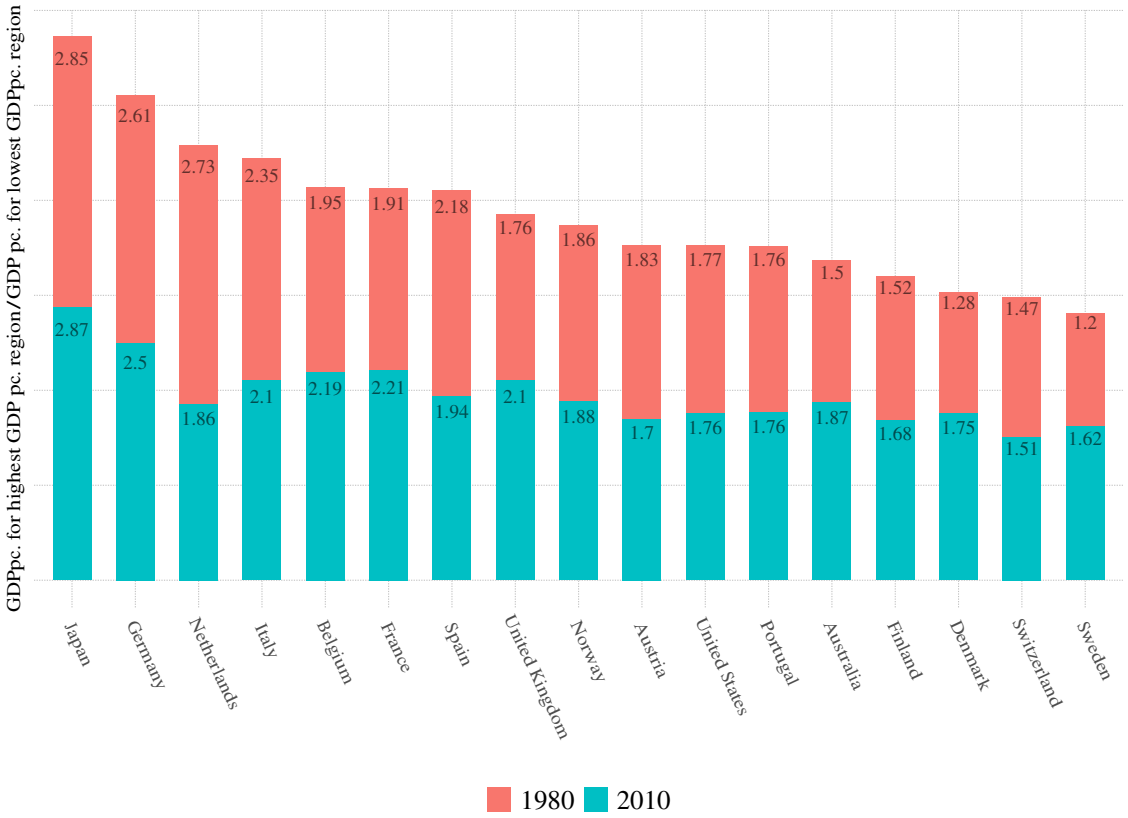

Figure 2. This figure depicts the ratio of the GDP per capita in the region with the highest GDP per capita to the GDP per capita in the region with the lowest GDP per capita for each country in the sample for the years 2010 and 1980. Sources: Rosés and Wolf (2020); Wenz et al. (2023).

U.S. regions since 1840, and Rosés and Wolf (2018*b*), which provides a detailed analysis of convergence for a range of Western European countries since 1900. Following these contributions, our starting point is the following regression,

$$g_{rt,\tau} = \alpha_c + \beta \log\left(Y_{r\tau}\right) + \sum_{k=1}^{C_\tau} \beta_k \theta_k \log\left(Y_{r\tau}\right) + \gamma X'_{r\tau} + u_{rt,\tau}, \qquad (1)$$

where $g_{rt,\tau}$ denotes the average annual growth rate in GDP per capita for region r from year τ to year t.[5] $Y_{r\tau}$ denotes the GDP per capita for region r at time τ. The parameter β captures the effect of a one hundred percent change in regional GDP per capita in year τ on the average annual growth rate between t and τ. A negative β indicates convergence, while a positive β indicates divergence. To capture regional convergence rates across countries, we interact GDP per capita in year τ with country-specific indicators, θ_k, where C_τ represents the number of countries in the sample at time τ. We refer to the specification where the country-specific indicators are omitted as the simplified regression specification.

Our baseline specification includes a range of controls. The term α_c represents a country-fixed effect, controlling for unobserved, country-specific determinants of regional growth. X'_r is a $K \times 1$ vector of time-invariant location fundamentals at the regional level.[6] The rate of *conditional convergence* refers to the β coefficient

[5] $g_{rt,\tau} = \left(\left(\frac{Y_{rt}}{Y_{r\tau}}\right)^{\frac{1}{t-\tau}} - 1\right) \times 100.$

[6] In the baseline specification, the controls include an indicator for the region containing the capital city, distance to the coast, presence of a major river, elevation, terrain rugged-

when controls are included, while the rate of *unconditional convergence* is measured without controls. Lastly, $u_{rt,\tau}$ is an unobserved error term. Standard errors are clustered at the regional level. We estimate Equation 1 over extended time horizons, with $t - \tau$ ranging from 30 to 40 years, allowing us to capture low-frequency trends that shape patterns of regional convergence.

2.4 The Evolution of Regional Income Gaps

We begin by examining the evolution of spatial income gaps by estimating regression 1 separately for three periods: 1900-1938, 1950-1980, and 1980-2010. For each period, we include all countries for which data are available. For the 1900-1938 and 1950-1980 periods, data are available for 15 countries while for the 1980-2010 period, the data cover 17 countries.

Consider the convergence rates across the 17 countries from 1980 to 2010. Figure 3 displays the estimated country-specific β coefficients along with their corresponding 95 percent confidence intervals, revealing several important patterns. First, 13 countries experienced β-convergence in regional GDP per capita during this period. This is statistically significant for 6 of the countries, which all have β coefficients less than or around -1. As a result, within these countries, regions with a ten percent difference in their regional GDP per capita in 1980

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ness, potential caloric yield, longitude, latitude, and an indicator for the region with the highest density of economic activity in period τ (measured as the GDP per square kilometer).

experienced a difference of 0.1 in their average annual rate of growth. Second, while 4 countries have β coefficients greater than zero, only one of these coefficients is statistically significant. As such, we do not find strong evidence of regional divergence. However, it should be noted that many countries have few regions, and as a result, the coefficients are imprecisely estimated. To put the magnitude in context, when we estimate an average convergence rate without country-specific slopes, we find a convergence coefficient of -0.75. In the following section, we explore how these convergence patterns have shifted over time.

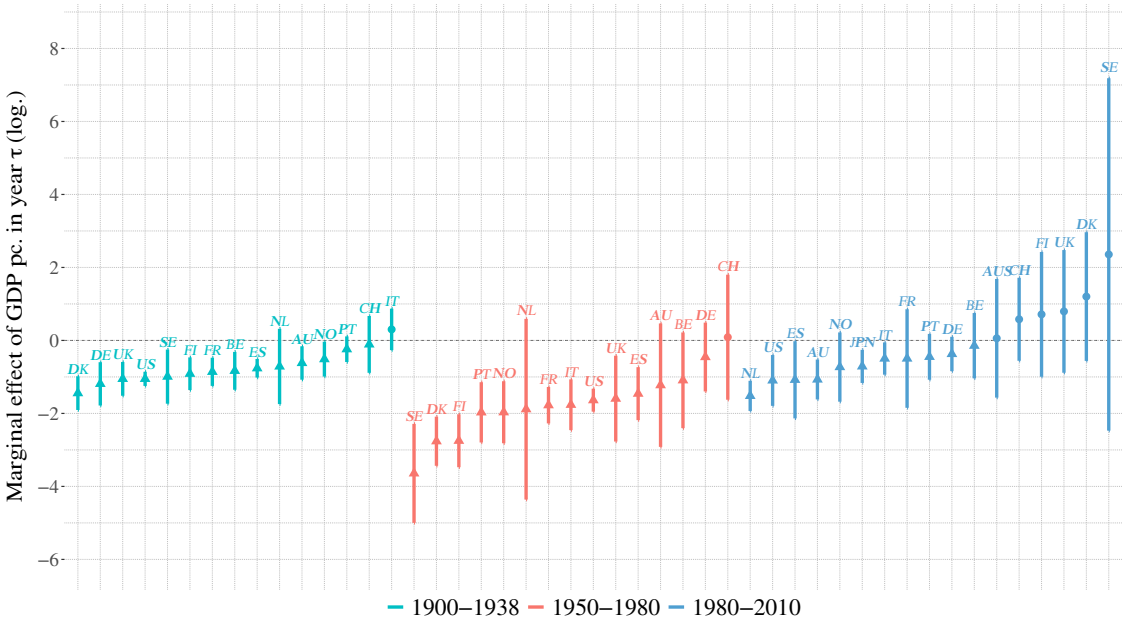

Figure 3. This figure depicts $\beta + \beta_k$ in equation (1), along with its corresponding 95 percent confidence interval. The model is estimated separately for 1900-1938, 1950-1980, and 1980-2010. France is retained as the baseline. Circles denote countries where $\beta + \beta_k$ is greater than zero (divergence) and triangles denote countries where $\beta + \beta_k$ is less than zero (convergence).

2.5 *Has the Evolution of Regional Income Gaps Changed?*

How have these income gaps evolved? To explore this, we estimate Equation 1 separately for the periods 1900-1938, 1950-1980, and 1980-2010. In Figure 3, we present each β coefficient alongside their corresponding 95 percent confidence intervals, revealing two notable patterns. First, over a longer period, convergence is common and comparable with the rates of convergence found *across* countries. Specifically, when estimating Equation 1 at the country level using data from Bolt and Van Zanden (2024), we find a $\hat{\beta}$ of -0.8 between 1900 and 2000. Second, Figure 3 suggests that rates of convergence peaked during the period of rapid economic growth following World War II but have declined since the 1980s. While only one country experienced divergence between 1950 and 1980, the number of countries exhibiting divergence has increased to four since 1980. During the 1950 to 1980 period, we find negative and statistically significant β coefficients in 10 countries. Collectively, these findings suggest a slowdown in regional convergence since the 1980s. Excluding country-specific slope parameters, we find a convergence coefficient of -1.47 between 1950 and 1980. As a result, the average rate of convergence for the 1980-2010 period (-0.75) is lower than that for the 1950-1980 period.

2.6 *Why Has Unconditional Convergence Slowed?*

Why has the rate of convergence slowed on average? While some of the coefficients in $X'_{r\tau}$ from the simplified regression remain stable across the 1950-1980

and 1980-2010 periods, we find a sizable change in the association between growth and the indicator for high economic density at the baseline, measured as the density of economic activity as the GDP per square kilometer. During the period of convergence from 1950 to 1980, this association was given by 0.33. For the period 1980-2010, it increases to 0.48.[7] This suggests a higher relative annual average growth rate in regions with high economic density in the baseline period. Since regions with high economic density tend to have higher GDP per capita, increased growth in these regions may help explain the lower observed rate of convergence.

To determine whether lower rates of absolute convergence can be attributed to accelerated growth in densely populated regions, we follow Kremer, Willis and You (2021) and decompose the change of absolute convergence into three components. Specifically, the rate of unconditional convergence between years t and τ is given by

$$\beta^* = \beta + \sum_{k \in K} \gamma_{k\tau} \delta_{k\tau}, \tag{2}$$

where β denotes the rate of conditional convergence, $\gamma_{i\tau}$ represents the regression parameter of the i^{th} covariate in the simplified regression specification, and $\delta_{i\tau}$ denotes the regression parameter from a bivariate regression of covariate i on GDP per capita in year τ. Consequently, the change in the rate of unconditional

[7]These findings are consistent with Rosés and Wolf (2018*b*), which document particularly high growth in capital regions after 1980.

convergence between the periods 1980-2010 and 1950-1980 can be expressed as

$$\Delta\beta^* = \Delta\beta + \Delta\gamma_D\delta_D + \sum_{i=1}^{K-1} \Delta\gamma_i\delta_i. \tag{3}$$

From Equation 3, we can conclude that changes in absolute convergence can be attributed to changes in conditional convergence ($\Delta\beta$), shifts in the association between covariates and GDP per capita, as well as the covariates and growth, ($\sum_{i=1}^{K} \Delta\gamma_i\delta_i$), and changes in the association between density and growth, as well as density and GDP per capita, ($\Delta\gamma_D\delta_D$).

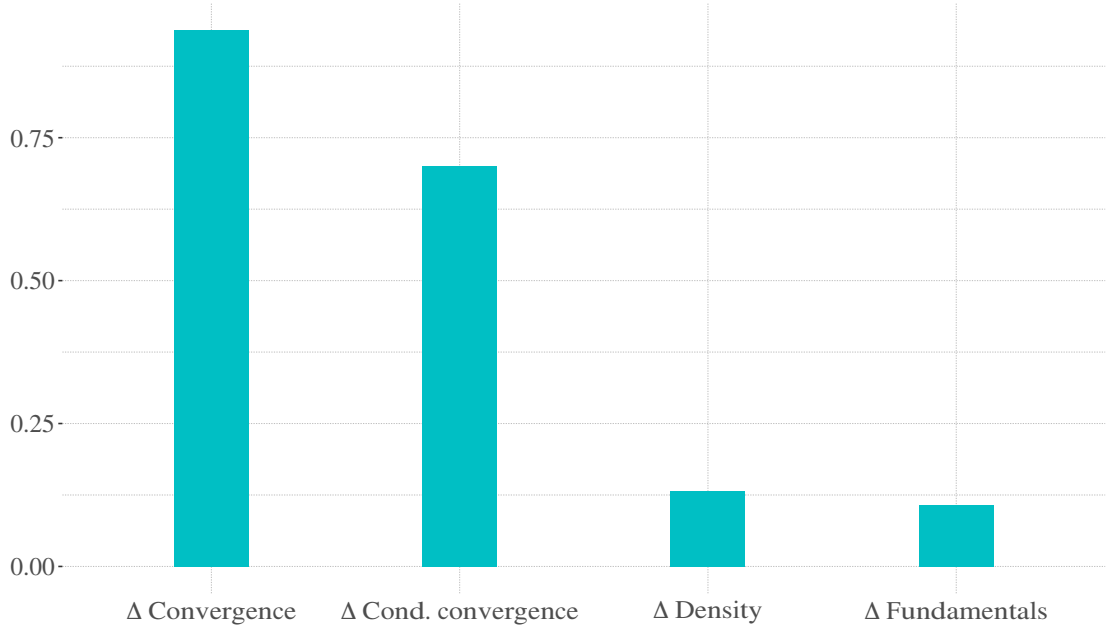

Figure 4. This figure depicts the decomposition of the change of the unconditional rate of convergence between the periods 1950-1980 and 1980-2010 using Equation 3.

We use this decomposition to quantify the impact of higher growth in high economic density locations on the decline in the unconditional rate of convergence. For this analysis, we omit Australia, Canada, and Japan due to limited spatial

and temporal coverage. The results are presented in Figure 4. The first bar represents the total reduction in the rate of unconditional convergence during the period, which decreased from -1.35 to -0.41, resulting in a change of 0.94. The second column suggests that the most important contribution to this decline is a reduction in conditional convergence. Specifically, the rates of convergence across regions with similar observable location fundamentals account for approximately 74.66 percent of the total change. The third column illustrates the impact of changes in the role of high economic density regions. This factor contributes about 14 percent of the total change, exceeding the combined contributions of other location fundamentals. Since the association between high economic density and GDP per capita remains stable over the period (δ_D), this change is largely driven by the changing association between density and growth. Altogether, these findings suggest that the changing relationship between growth and economic density is a key factor in the observed decline in the rate of convergence identified in the previous section. However, a limitation of this analysis is that potentially significant factors explaining growth are unobserved at the regional level.

2.7 Persistent Regional Income Differences

Figure 3 and 4 suggest a deceleration of regional convergence since 1980, which potentially contributes to the persistence of spatial income gaps within countries. This section explores this issue by examining how GDP per capita rankings of regions evolve over time. Specifically, we categorize regions into quintiles

based on GDP per capita for the first decade of available data and for 2010. The first quintile represents the poorest 20 percent of regions, while the fifth quintile represents the richest 20 percent. We then consider the correlation between a region's quintile in the initial year for which data is available and its corresponding quintile in 2010. This correlation will highlight the extent to which regions transition across different income quintiles within countries over time. For this analysis, we use all 20 countries in the sample.

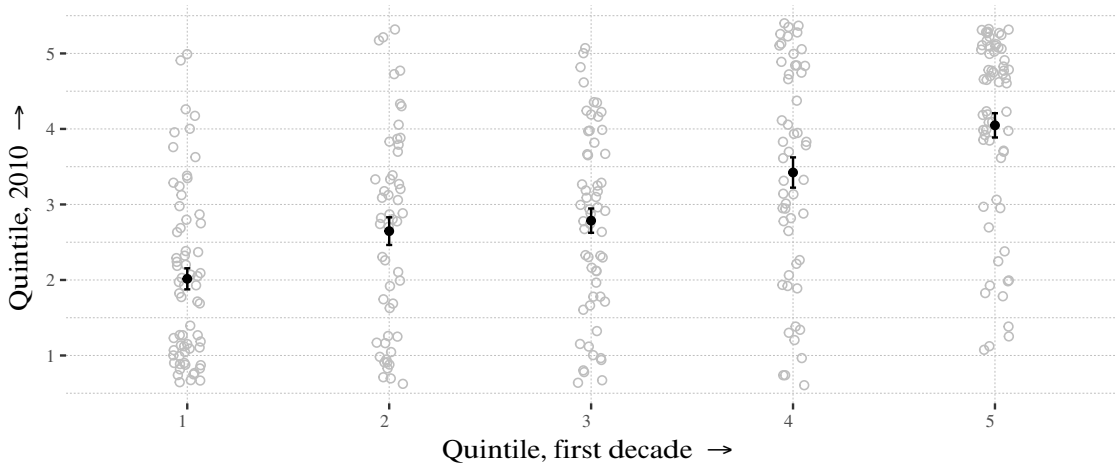

Figure 5. The figure depicts GDP per capita quintiles in the first year data is available and 2010. For each region in the sample, the quintiles in the first year data are available and 2010 are calculated. Quintiles are calculated within each country. The horizontal axis denotes the quintile in the first year data is available. The vertical axis denotes the quintile in 2010. 1 denotes the regions with the 20 percent lowest GDP per capita and 5 the regions with the 20 percent highest GDP per capita. The solid dots denote the average quintile in 2010 for each quintile in the first year with their corresponding 95 percent confidence intervals. The data are jittered.

The results, presented in Figure 5, show two notable patterns. First, the regions with the lowest GDP per capita (first quintile) and the regions with the highest (fifth quintile) tend to maintain their relative positions throughout the period, as evidenced by a higher concentration of regions at both ends of the

distributions. Second, while the relative positions of regions are stable, there is more movement in the rankings for the middle quintiles, indicating a degree of mobility and consistent with the average convergence rates estimated earlier. Overall, these findings suggest a tendency for regional rankings to persist over time. High-income regions are likely to remain high-income, while low-income regions are likely to remain low-income.[8] This pattern underscores the incomplete convergence of GDP per capita among the regions in our sample.

2.8 Summary

To conclude this section, we briefly summarise the empirical patterns we have documented. While countries in our sample differ in the prevalence of convergence, divergence, and persistence over time, several broad trends emerge. First, while significant spatial income gaps have persisted within countries throughout the sample period, these gaps have generally declined over time, with catch-up growth in poorer regions from 1950 to 1980 playing a key role in many cases. Second, since the 1980s, growth has slowed in most countries, with convergence decelerating as high-density regions (often those with the highest income) experienced more modest reductions in their growth rates. Finally, due to this incomplete nature of convergence, regional income levels exhibit considerable persistence across the study period for most countries. We now turn to the

[8] A similar pattern emerges when we exclude countries for which data is only available from 1960 onwards.

literature that aims to explain these patterns.

3 What Drives the Evolution of Regional Income Gaps?

We begin this section with a discussion of the key factors identified in the literature as contributors to regional income disparities, including human capital, institutions, and geography. Next, we consider the literature on regional convergence, focusing on the significance of factor mobility and technology diffusion. We then explore why regional convergence has decelerated in recent decades, with recent contributions emphasizing the role of skill-biased technical change and the widespread adoption of information and communication technologies (ICT). Finally, we address the issue of persistent regional income gaps, highlighting the importance of location fundamentals and agglomeration economies, which can give rise to multiple spatial equilibria.

3.1 Accounting for the Size of Regional Income Differences

What factors might explain the spatial income gaps documented in Section 2.4? A large body of literature in economic geography emphasizes the role of first- and second-nature geography in explaining the location of economic activity. First-nature geography includes factors that are largely exogenous to human activity, such as a region's natural endowments. Henderson et al. (2018) find that these factors alone can account for roughly 47 percent of the global variation in nightlight luminosity, a common proxy for economic activity. While the

importance of natural endowments is well established, geographical endowments alone may struggle to account for rapid changes in regional income gaps. The time-varying impact of location fundamentals remains an underexplored area in the literature, though recent work on the interaction between endowments and technological progress has started to address this gap (see e.g. Fernihough and O'Rourke (2021); Fritzsche and Wolf (2023) on the changing role of coal in economic growth).

Second-nature fundamentals reflect features shaped by human intervention, including historically sunk investments, infrastructure access, or proximity to economic centres of activity (see e.g. Fujita, Krugman and Venables, 1999; Redding and Sturm, 2008). These factors play a significant role in explaining the spatial distribution of economic activity. Allen and Arkolakis (2014) use a quantitative spatial model to decompose income variation across U.S. counties in 2000. Their findings attribute around 20 percent of the observed income distribution to connectivity with other economic centres.

Several contributions in macroeconomics have explored a broader set of factors through the lens of development accounting (see e.g. Hsieh and Klenow, 2010). Using regional data spanning 110 countries, Gennaioli et al. (2013) and Gennaioli et al. (2014) find that human capital plays an important role in accounting for regional income differences and growth. Similarly, Acemoglu and Dell (2010) highlight the importance of institutional quality in addition to human capital, mirroring findings in the cross-country literature (see also Tabellini, 2010).

The significance of regional differences in human capital and labour mobility underscores the importance of understanding sources of spatial frictions and their impact on income disparities across locations (Combes, Duranton and Gobillon, 2008; Young, 2013).

3.2 Convergence

Regional convergence has long received attention in macroeconomics (Barro et al., 1991; Barro and Sala-i Martin, 1992; Sala-i Martin, 1996*b*). These studies typically start from the closed economy Solow model, which emphasises the role of factor accumulation in driving changes in spatial income gaps (Solow, 1956). While this literature has provided substantial evidence of regional convergence, it has drawn criticism for insufficiently accounting for regional interdependencies (see e.g. Magrini, 2004; Breinlich, Ottaviano and Temple, 2014). In particular, the mobility of factors of production and final goods will tend to erode differences in their rates of return across regions. Furthermore, trade in goods and factors can facilitate technology diffusion (Grossman and Helpman, 1991), narrowing regional disparities over time. Consistent with this view, Gennaioli et al. (2014) find that regional convergence is stronger in countries with more developed capital markets, underscoring the importance of institutional factors and low barriers to capital mobility in facilitating convergence.

Research in economic geography has examined how intranational trade costs and increasing returns contribute to regional income disparities (Krugman, 1991*b*;

Fujita, Krugman and Venables, 1999). These models highlight the appeal of larger markets for both living and production, which generates a self-reinforcing cycle of migration and industry concentration. As trade costs diminish, convergence can emerge as industry relocates to regions with low wages or workers move to areas with high wages (Puga, 1999). Evidence consistent with these mechanisms can be found in Rosés, Martínez-Galarraga and Tirado (2010), Combes et al. (2011) and Crafts and Klein (2021). While this literature has provided important insights, these models often come with simplifications that limit their empirical applicability (see e.g. Redding and Rossi-Hansberg, 2017). In recent years, substantial progress has been made in understanding the properties of models with more realistic geographies and rich spatial heterogeneity (see e.g. Allen and Arkolakis, 2014). However, these models are often static and therefore lack many important mechanisms highlighted in the macroeconomic literature.

A key challenge in closing this gap lies in incorporating forward-looking behaviour into models that capture detailed spatial heterogeneity. One approach is to reduce the dimensionality of the problem with structural assumptions. For instance, Allen and Donaldson (2020) impose an overlapping generation structure where each period is sufficiently long for agents to fully discount the future. Desmet and Rossi-Hansberg (2014) develop a spatial endogenous growth model where firms invest in technology. Other examples of this approach can be found in Trew (2014), Desmet, Nagy and Rossi-Hansberg (2018), and Peters (2022), which assumes that technology diffuses spatially and that innovation realisations

are spatially correlated, rendering the innovation decision static. Nagy (2020) embeds similar innovation dynamics in a model with complementarity between agricultural goods and labour, which introduces a positive relationship between the availability of agricultural goods and productivity growth. This mechanism accounts for rapid population convergence between macro-regions of the US between 1790 and 1860.

A recent important contribution by Kleinman, Liu and Redding (2023) embeds forward-looking investment decisions in a spatial model with rich spatial heterogeneity. Following Moll (2014), the model distinguishes between capital owners who invest to maximize expected net present income but are immobile across locations, and workers, who are mobile but live "hand-to-mouth". These assumptions allow for the dynamics of the model to be characterised in closed form. Initial conditions, rather than the path of shocks to productivities, amenities, or trade costs, are shown to be crucial in accounting for convergence dynamics across US states since 1960. These results underscore the importance of incorporating capital accumulation in explaining patterns of regional convergence.

Finally, several key contributions emphasize the role of structural transformation in explaining regional convergence. Many of these models emphasise the role of low income elasticities of agricultural consumption and technological progress in the agricultural sector as key drivers (see e.g. Herrendorf, Rogerson and Valentinyi, 2014). However, Caselli and Coleman (2001) contend that this would result in a decline in agricultural prices, contrary to the observed trend

for the US since 1940. Instead, the authors show that improved access to human capital leads to lower agricultural labour supply and to a convergence of agricultural and urban wages, helping explain income convergence between northern and southern US states. Eckert and Peters (2022) highlight the significance of low initial productivity in rural sectors and regions as a key driver of regional convergence (see also Acemoglu, Aghion and Zilibotti, 2006). Building on the observation that rural locations experienced more rapid growth between 1880 and 1930, they construct a spatial model with non-homothetic preferences to explore the drivers of convergence. Although lower demand for agricultural goods disadvantaged rural locations as incomes grew, a larger distance to the technological frontier also facilitated rapid productivity growth. Similar channels might have operated in other countries in our sample, many of which experienced rapid structural transformation since 1900 (Rosés and Wolf, 2021).

3.3 Divergence

While regional disparities have narrowed, especially after a period of rapid growth post-World War II, the empirical facts documented in Section 2 suggest a slowdown in both absolute and conditional convergence across many countries since 1980. Growth decelerated mostly everywhere, but less in regions with the highest density of economic activity. In this section, we highlight a few prominent theories linking this phenomenon to concurrent trends in the last decades. These include skill-biased technical change, the advent of information

and communication technology (ICT), structural transformation toward services, and increased exposure to globalisation.

A leading explanation for the slowdown in regional convergence in the U.S. since the 1980s is skill-biased technical change (see e.g. Katz and Murphy, 1992). Technological advancements disproportionately favouring skilled workers over their unskilled counterparts can widen the wage gap between the two groups.[9] The impact of skill-biased technical change is particularly pronounced in larger cities, where there is a higher concentration of skilled workers and advanced technologies.

The literature offers several explanations for this amplification. Diamond (2016) finds that endogenous amenities in large cities accelerate skill-biased technical change, creating a self-reinforcing cycle that attracts relatively more skilled labour. An influx of skilled workers further promotes higher productivity, widening the gap between large and small cities. Rubinton (2022) highlights a similar dynamic, showing that firms in larger cities, which benefit from bigger markets, better amenities, and higher productivity for skilled workers, are strongly incentivised to adopt skill-biased technologies. This trend leads to divergence between larger and smaller cities over time. Spillovers among high-skilled workers in large cities may also be a factor. Giannone (2022) shows that a substantial share of the reversal in regional convergence since the 1980s can be attributed to this subset

[9]This phenomenon has been extensively studied in the context of the labour market, with implications for regional economic disparities.

of workers. To explain this phenomenon, Giannone (2022) uses a spatial framework that incorporates heterogeneous workers and skill-biased technical change, extending the work of Desmet, Nagy and Rossi-Hansberg (2018). The model suggests that the impact of skill-biased technical change is more pronounced in high-skill regions when local knowledge spillovers among high-skilled workers are substantial.

Another strand of literature highlights how technological advancements, especially in the form of information and communication technology (ICT), have contributed to regional divergence.[10] Eckert, Ganapati and Walsh (2022) study the geographic impact of the widespread adoption of ICT since the 1980s. They find that the accelerated growth in wealthier urban areas can be attributed to specific service industries that are intensive in the use of ICT. Their findings are explained through a model where the complementarity between labour and capital depends on the level of firm output. In high-productivity areas, labour demand therefore increases by more in response to declining ICT prices. This pattern is consistent with the observed trend of relatively faster growth since 1980 in regions with the highest density of economic activity.

Another factor contributing to regional divergence is the spatial sorting of firms, which can increase both the mean and dispersion of wages across locations.

[10]This builds on a literature that documents the impact of ICT and skill-biased technical change as drivers of income inequality (see e.g. Autor, Levy and Murnane, 2003; Beaudry, Doms and Lewis, 2010)

Lindenlaub, Oh and Peters (2022) develop a model of firm sorting, where heterogeneous firms first choose a location and then hire workers in a frictional local labour market. Firms face the following trade-off: operating in high-productivity areas increases output per worker but also intensifies competition for labour, making it harder to retain workers, which constrains firm size. Firm location choices can contribute to both wage inequality and regional divergence, explaining at least 16% of the variation in mean wages and 38% of the variation in wage dispersion within locations. In a related contribution, Mann (2023) builds a search model of two-sided spatial sorting. Using West German data from 1975 to 2018, Mann (2023) finds that highly productive firms and workers concentrate disproportionately in affluent locations and that the spatial sorting of firms is significantly stronger than that of workers. The spatial sorting of firms is shown to be an important determinant of workers' job ladders and lifetime values.[11]

Structural transformation towards services has played a significant role in shaping regional economic patterns in recent decades, as documented by Chen et al. (2023) for the case of France. As the country transitioned from a manufacturing to a service-oriented economy, this shift was concentrated in the largest cities with the highest density of economic activity, where the services sector grew disproportionately. In contrast, manufacturing reoriented towards less populous locations. This pattern was driven by the behaviour of large firms, with

[11]See also Behrens, Duranton and Robert-Nicoud (2014) for a link between worker sorting, selection, and agglomeration economies.

large services firms expanding in urban areas and large manufacturing firms expanding in other parts of the country. A crucial factor contributing to this *urban biased* structural change was the strengthening of agglomeration externalities in services relative to manufacturing. Chatterjee, Giannone and Kuno (2023) also link the deceleration in regional convergence to structural transformation towards services, noting that service employment is more spatially concentrated than manufacturing or agriculture.

The spatial concentration of services employment can be linked to housing supply. Eeckhout, Hedtrich and Pinheiro (2021) show that the composition of production factors that firms choose varies geographically. Labour and ICT demand are shown to vary significantly with a city's cost of living, since workers must be compensated for local housing prices, while ICT is a highly tradable good that can be bought at similar prices everywhere. As a result, firms find it beneficial to use ICT more intensively in expensive cities, where house prices co-move with labour productivity and wages. As routine tasks disproportionately increase labour costs, firms in more productive areas are inclined to replace such tasks with ICT.

Alongside the diffusion of information technology, the economies in our sample have also become more open to international trade. A growing literature has documented how differences in industry composition across locations mediate the impact of trade shocks. In an influential paper, Autor, Dorn and Hanson (2013) show that U.S. regions more exposed to import competition due

to their industry composition experienced greater declines in manufacturing employment and wages. Given the substantial regional variation in industry composition and the challenges associated with labour mobility across sectors and regions, the effects of import competition can be highly localized (Caliendo, Dvorkin and Parro, 2019). Recent work by Bloom et al. (2024) and Quintana (2021) shows how the impact of trade shocks also depends on a region's initial human capital endowment. In high human capital areas of the U.S., job reallocation from manufacturing to services was more pronounced, with firms adapting by switching industries and reallocating labour within their organisations. As a result, job losses in manufacturing were outweighed by service sector gains, leading to net employment growth. By contrast, in low human capital regions with high manufacturing dependence, such as the South and Midwest, weaker labour reallocation meant that service job gains barely offset manufacturing job losses. This divergence contributed to the changing geography of employment in the U.S., with job growth increasingly concentrated in skill-dense urban areas. These results provide a contrast to the more uniformly negative effects of trade shocks found in earlier studies.

While much of the literature has focused on partial equilibrium effects, recent work highlights how trade shocks can also generate structural transformation. The decline in trade costs and the advent of communication technology have not only contributed to deindustrialisation but have also facilitated the expansion of global (financial) services. These general equilibrium effects, as emphasized

by Beck and Doerr (2023) in the U.S. context, are also relevant for Europe and beyond. In line with the literature's emphasis on skill-biased technical change, Burstein and Vogel (2017) argue that trade affects the skill premium through a differential impact on small and large firms. Since large firms are more intensive in the use of skilled workers and trade integration shifts factors of production towards larger firms, trade tends to increase the skill premium. These dynamics have potential implications for spatial inequality, especially given the increased degree of geographic sorting by skill highlighted previously. The rise of multi-region service firms may also account for the growing skill differentials in wages across regions. Kleinman (2024) explores the link between firm expansion and the increasing spatial inequality and segregation. Larger firms, serving more markets, tend to pay higher wages and exhibit greater wage inequality between headquarters and branches, with this dynamic intensifying as firms expand geographically. This contributes to rising regional inequality and skill segregation. Within-firm dynamics can also contribute to regional inequality, as firms demand more skilled labour and offer higher wages at their headquarters. Local markets can then specialize in hosting headquarters and providing services to other regions, creating spatial disparities in income and skill levels. The extent of this specialisation depends on the ability of firms to expand across space. The distributional consequences of globalisation therefore depend on both the localized effects of import competition and the broader reallocation of economic activity towards high-skill, service-oriented industries.

Why are some regions more vulnerable to macroeconomic shocks and less resilient to structural change? Several contributions have emphasised the adverse effects of specialisation on growth (Glaeser et al., 1992; Duranton and Puga, 2001). Increased specialisation can limit innovation, leading to lower long-term growth (Feldman and Audretsch, 1999). A narrower industrial base can also make a region more vulnerable to macroeconomic shocks. For instance, Heblich et al. (2023) find that English and Welsh cities that specialized in a few industries in the late 19th century had more unskilled workers in the 1970s. The authors attribute this to dynamic agglomeration economies, which generate larger long-run productivity gains in cities with diversified industries.

The UK's exposure to global dynamics, coupled with substantial regional inequality, presents a particularly relevant case study. The 1970s were marked by a series of significant shocks within a short timespan, including deindustrialisation driven by a loss in relative manufacturing productivity, an oil price shock, and a stock market crash. Weaker economic regions have struggled to recover from these shocks (Rice and Venables, 2021). The 2008 financial crisis limited even modest growth in these areas, while more prosperous regions recovered more quickly. Unlike previous recoveries where productivity typically increased post-recession, productivity stagnated nationwide after 2008, with the most productive firms in weaker regions affected more than those in affluent regions (McCann, 2020). This remains only partially understood but may relate to the highly centralized UK banking system, which tends to disadvantage small and medium-

sized enterprises (SMEs) in peripheral areas (Mayer, McCann and Schumacher, 2021).

However, regions are not static entities; under certain conditions, they can adapt and recover from adverse shocks. A cross-country study by Gagliardi, Moretti and Serafinelli (2023) finds that some cities with historically high manufacturing employment have shown remarkable resilience, managing to surpass pre-deindustrialisation employment levels. They estimate that approximately 34% of former manufacturing hubs experienced employment growth above their national averages following industrial decline. However, this adaptability was not evenly distributed: in U.S. Rust Belt cities, recovery lagged compared to similarly affected areas in other advanced economies. A key determinant of these outcomes was again human capital. Cities with a higher proportion of college-educated workers at the peak of manufacturing enjoyed significantly faster employment growth in the decades after industrial decline than those with lower education levels, with this gap widening over time.

The impact of localised shocks on regional wage disparities can be mitigated if they induce migration from low- to high-wage regions. However, evidence suggests that housing constraints often limit relocation, which can exacerbate income gaps. For instance, Ganong and Shoag (2017) show that migration to high-wage areas in the U.S. has decreased significantly since the 1980s, with housing supply restrictions reducing the net benefits of relocation for low-skilled workers. A similar pattern emerges in the UK: despite relatively high interregional mobility,

Stansbury, Turner and Balls (2023) find that migration often moves in the "wrong" direction for convergence, as limited housing supply in high productivity areas reduce the wage premium for much of the income distribution. This is further compounded by the low supply elasticity of local housing supply. Drayton, Levell and Sturrock (2024) decompose housing stock responsiveness in the UK and find that constraints dampen local housing stock growth, particularly in dense urban areas. For instance, they estimate that if London's housing elasticity were at the national median, house price growth would have been 21 percentage points lower.

The factors we have discussed so far can also interact with each other to produce a spatially concentrated increase in inequality. These interdependencies can amplify regional disparities, leading to economic divergence over time. The specific drivers of spatial inequality will have different implications for the redistributive effects of spatial policy, which we will return to in Section 4.

3.4 Persistence

While there is strong evidence of regional convergence across many countries, the studies cited in the preceding section suggests that this process has stalled in recent decades. This is reflected in the persistence of regional income gaps shown in Figure 5. In this section, we turn to a large theoretical and empirical literature in economic geography that studies the drivers of persistence.

As previously discussed, a large share of the spatial distribution of economic

activity can be accounted for by location fundamentals or natural endowments (see e.g. Henderson et al., 2018). An influential study by Davis and Weinstein (2002) examines the determinants of city size in Japan over an extended period. The study finds that even in the aftermath of atomic bomb explosions, Japanese cities quickly reverted to their initial growth trajectories. This suggests that location fundamentals are an important determinant of the city size distribution. Similarly, Bosker and Buringh (2017) analyse the origins of Europe's urban network from 800-1800 AD, showing that medieval European cities emerged in response to favourable geography, such as river access, fertile land, and proximity to trade routes. These cities became "seeds" in a growing urban system, creating persistent regional hierarchies. Collectively, these findings underscore the importance of first-nature geography in shaping the location of economic activity. Since location fundamentals can be highly persistent, these findings also provide a potential explanation for the high degree of persistence in the spatial distribution of economic activity observed in our sample.

While first-nature fundamentals can affect the initial distribution of economic activity, regions can also differ greatly in second-nature fundamentals, or factors that are shaped or influenced by human activity, such as infrastructure, institutions, social networks, and linkages to other locations (see e.g. David, 1985; Krugman, 1991*a*). These factors can also affect growth, potentially altering the spatial distribution of economic activity over time. In particular, in the presence of strong agglomeration externalities, the location of economic activity may not

be uniquely determined by first-nature fundamentals, leading to the possibility of multiple equilibria in the spatial distribution of economic activity. A large literature provides evidence for multiple spatial equilibria through case studies, showing how temporary shocks can result in permanent economic changes (see e.g. Kline and Moretti, 2014; Hanlon, 2016; Heblich, Trew and Zylberberg, 2021). This suggests that historical locational advantages can continue to influence outcomes even after those advantages subside. For instance, Bleakley and Lin (2012) show that portage sites predict population density a century after portage became irrelevant. These findings suggest that even when first and second-nature fundamentals do not persist, they can have a lasting impact on the spatial distribution of economic activity, contributing to the persistence of spatial income gaps.

How important are multiple spatial equilibria in shaping the location of economic activity in practice? Allen and Donaldson (2020) study path dependence in U.S. economic geography from 1800 to 2000 using a model that incorporates rich spatial heterogeneity, agglomeration externalities, forward-looking agents, and heterogeneous locations interacting through costly trade and migration. While path dependence appears to be an important force shaping the geographic distribution of economic activity across U.S. counties, it is unclear how important multiple spatial equilibria are at more aggregate levels such as states. Nevertheless, the paper is an important step toward understanding the importance of historical factors in explaining the persistence of spatial income gaps across

regions.

4 The Challenge Faced by Big-push Policies

The highly persistent nature of spatial income inequalities highlights the scale of the task faced by any policy that aims to reduce them. One policy which has this aim is European Union (EU) Structural Funds, now known as Regional Development and Cohesion Funds and comprising the European Regional Development Fund and Cohesion Fund.[12] The rules on area eligibility have varied over time, but the programme has typically aimed to support economic growth and jobs in lagging areas, with specific convergence objectives. A large fraction of funds has historically flowed to regions with GDP per capita below a threshold, e.g. during 2000-2006 to Objective 1 Areas – regions within a country with GDP per capita less than 75 percent of the EU average, and eligibility for the Cohesion Fund is at the national level based on per capita GDP less than 90 percent of the EU average. For 2021-2027, the budget is nearly €400 billion, roughly a third of the total EU budget.[13] Much of this investment goes toward on infrastructure, such as transport and renewable energy or funding for innovation.

EU Structural Funds have been the subject of multiple evaluations. Becker,

[12]See Ehrlich and Overman (2020) and Neumark and Simpson (2015) for summaries of a wider set of place-based policies.

[13]https://eur-lex.europa.eu/summary/chapter/regional_policy.html?root_default=SUM_1_CODED=26&locale=en

Egger and von Ehrlich (2010, 2012) focus on the impact of Structural Funds expenditure on employment growth and growth in GDP per capita in Objective 1 regions.[14] Becker, Egger and von Ehrlich (2010) uses the (in principle) strict cut-off of GDP per capita below 75 percent of the EU average to implement a fuzzy regression discontinuity design. During the period in which regions receive funding the study finds a positive effect on growth in per capita GDP of around 1.6 percentage points per annum. The study's calculations suggest that the financial transfers are associated with a multiplier of 1.2, although a multiplier of 1.0 cannot be ruled out.[15]

Becker, Egger and von Ehrlich (2012) examine the effect of the intensity or generosity of EU Structural Funds on growth in income per capita and ask whether funds could have been distributed differently across regions to achieve higher aggregate growth at the EU level and faster convergence. The underlying

[14]Mohl and Hagen (2010) provide a thorough overview of EU Structural Funds evaluations, concluding that the majority of studies find positive effects on regional income growth or on convergence.

[15]These cut-offs are defined in terms of GDP per capita, which may be biased upwards due to the lack of regional price deflators. As discussed earlier in this chapter, differences in regional GDP per capita are not adjusted for differences in purchasing power parity (PPP). Since prices tend to be positively correlated with income, this means that differences in regional GDP per capita may overstate income disparities across regions. This must be seen as an upper bound for the actual income differences between regions, and the potential bias introduced by ignoring regional price differences should be considered when evaluating the effectiveness of place-based policies.

idea is that Structural Funds might need to exceed a minimum threshold to generate a "big push", while also recognising the potential for diminishing returns as transfer intensity increases. During the period 1994-2006, the authors document substantial variation in annual transfers, from less than 0.0001 percent of GDP for a region in Sweden to 29 percent of GDP for a region in Greece, with an average of around 0.8 percent.

The authors then estimate treatment effects at varying transfer intensities. Their analysis confirms that on average, the effects of the transfers on regional growth are positive, and they find no evidence of a lower bound with even small transfers generating positive effects. Their analysis also allows them to draw conclusions on the optimal distribution of funds. For example, they find that around 18 percent of regions received funding above what they define as the "maximum desirable treatment intensity" (a level of transfers of 1.3 percent of GDP, beyond which they cannot reject that there are zero effects on growth). Had funds been redistributed away towards regions with lower transfer intensities, average regional growth in income per capita would have been higher. The authors' broader implications highlight a key trade off in policy making to reduce regional disparities, as an increase in convergence may come at the expense of lower aggregate growth.

Blouri and Ehrlich (2020) reach a similar conclusion, finding that a budget-neutral redistribution of Structural Funds could have resulted in higher welfare gains. They incorporate regional transfers in a structural general equilibrium

model featuring population mobility, inter-regional trade, and agglomeration externalities. This framework allows them to derive an optimal allocation of EU funding streams, suggesting that wage subsidies are most effective when directed toward lagging peripheral regions, while transport investments generate larger aggregate welfare gains in more productive core regions, although at the cost of increased regional income inequality. A similar question is explored in the U.S. context by Fajgelbaum and Gaubert (2020).

Two examples of large-scale regional development programmes in the US are the Tennessee Valley Authority (TVA), the effects of which are evaluated in the Kline and Moretti (2014) and the Appalachian Regional Commission (ARC) analysed by Isserman and Rephann (1995) and Glaeser and Gottlieb (2008). The TVA involved very substantial investment in public infrastructure including transport, energy and schools with an aim of attracting manufacturing activity. Funding ran from the 1930s to 2000, with expenditure peaking in the 1940s and 1950s.[16] The targeted area spanned four US states: nearly all of Tennessee and parts of Kentucky, Alabama and Mississippi. In their evaluation, Kline and Moretti (2014) construct control areas from other potential regional authorities which were proposed but did not go ahead for political reasons. They find that over the long-run, the investment generated structural change and household income growth. They identify a significant role for agglomeration externalities,

[16]Transfers per household amounted to around 10 percent of average income.

with the TVA counties remaining an attractive location for new manufacturing even after the cessation of public funding.

Kline and Moretti (2014) also address the question of whether the benefits to the TVA counties came at the expense of the aggregate. The authors distinguish two channels through which benefits accrue – the direct effect of publicly-funded infrastructure in raising private-sector productivity, and the indirect effect arising from agglomeration externalities. They highlight that the second channel cannot have a positive effect on aggregate unless there exists heterogeneity in local agglomeration elasticities; if instead the elasticity is constant, a spatial redistribution of activity results in no aggregate benefit. Their evidence suggests that while the direct effects of the policy did not persist beyond the main period of funding up to 1960, the indirect effects from agglomeration externalities did. However, since they also find that the agglomeration elasticity is constant across locations, they argue that spatial reallocation results in no aggregate benefit or cost, with benefits to the TVA counties offset by losses elsewhere (see Fajgelbaum and Gaubert (2020) for a model where transfers can lead to efficiency gains).

Isserman and Rephann (1995) and Glaeser and Gottlieb (2008) evaluate the effects of the ARC, which began in 1963 and provided federal funding for transportation infrastructure, health and education to counties spanning from Mississippi to New York, with the two papers coming to differing conclusions. While Isserman and Rephann find large positive effects on in income per-capita, Glaeser and Gottlieb (2008) find no statistically significant effects on growth in

income per capita, although large standard errors mean they cannot rule out positive effects. The different conclusions may reflect the use of different control groups, but they also highlight the challenges of evaluating the long-run effects of large-scale, multifaceted expenditure programmes, particularly in controlling for unobserved confounding factors and other policies that may affect growth.

Ehrlich and Seidel (2018) study the long-run effects of the Zonenrandgebiet place-based policy introduced in the 1970s in West-Germany and (unexpectedly) discontinued after re-unification in regions near the Iron Curtain, which had been cut off from markets on their Eastern border. This policy aimed to stimulate economic development through large-scale transfers, including firm investment subsidies and public infrastructure funding. The authors find persistent effects on density, likely driven by higher public investment. However, the study also finds evidence for unintended consequences consistent with theoretical predictions: local spatial displacement of economic activity and capitalisation of benefits into land prices, which may offset nominal income gains.

Given the scale of expenditure associated with "big push" type policies, key questions are - where to push, how much, and how to pinpoint any trade-offs between aggregate and regional welfare gains. Both Blouri and Ehrlich (2020) and Fajgelbaum and Gaubert (2020) aim to tackle these questions, with the latter proposing that incentives to induce transfers of high-skilled workers to lower-wage, low-skill intensive locations can be efficiency improving due to productivity spillovers, and that the current pattern of worker sorting in the US

is inefficient. A second question is how such policies should be financed. In this context, Gaubert et al. (2021) analyse optimal place-based redistribution via location-based transfers and taxation.

Finally, as noted above, structural and technological change, together with polices enacted at a national and international level, all affect regional inequality, likely much more so over the long-run than place-based policies themselves. As discussed in Section 3, changes in trade policy have regional implications based on initial industrial structure (Autor, Dorn and Hanson (2013) for the US; Dix-Carneiro and Kovak (2017) for Brazil) or based on city size and market access (Brülhart, Carrère and Robert-Nicoud (2018) for Austria following the fall of the Iron Curtain). As a recent example, Beck and Doerr (2023) investigate the impact of banking deregulation in the 1980s at the state-level in the US and show that increased competition among banks in urban areas fueled growth and exacerbated within-state urban-rural inequalities. These findings highlight the strength of economic forces that shape changes in the spatial distribution of economic growth, that national and regional policies might work against each other, and given the persistence in spatial inequalities the sheer scale of the task for place-based policies seeking to turn the tide.

5 Conclusion

This chapter began with a descriptive overview of regional income gaps across developed economies over the last decades, documenting three stylised facts

to organise our review of the literature. First, although substantial regional income gaps have existed within countries throughout the sample period, these disparities have generally narrowed over time. Regional convergence is largely attributed to catch-up growth in poorer regions, particularly between 1950 and 1980. Second, while growth slowed across most countries in the sample after the 1980s, regions with the highest density of economic activity experienced relatively smaller declines. This unevenness in the deceleration of growth has lowered the rate of regional convergence. Finally, due to the incomplete process of convergence, relative regional income levels have shown a high degree of persistence across the study period for most countries in our sample.

To understand the underpinnings and evolution of regional disparities, we turned to the literature on economic growth and economic geography. Our review of the literature began with the key factors contributing to regional income disparities, including human capital, institutions, and geographical attributes. We then explored the literature on regional convergence, focusing the roles of factor mobility, technology diffusion, and structural transformation. We also investigated the recent slowdown in regional convergence, with particular emphasis on the impact of skill-biased technical change, globalisation, and the proliferation of information and communication technologies (ICT). Lastly, we considered the persistence of regional income gaps, highlighting the significance of location fundamentals and agglomeration economies, which can lead to multiple spatial equilibria. The persistent nature of spatial inequalities underscores the challenges

faced by policies to mitigate them. We concluded this chapter with an overview of recent "big-push policies", evaluating their effectiveness and highlighting important design considerations in light of potential trade-offs between regional convergence and aggregate growth.

Are we witnessing a temporary stall in the post-war process of convergence, or will divergence continue? Extrapolating from past experience, the future evolution of regional income gaps will depend on the direction of technological progress and how societies respond to the challenges and opportunities it brings. While current trends are not without precedent, projecting from past experiences may be misleading, as these developments can interact in complex ways.

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