CHAPTER 2

CLOSER TOGETHER OR FURTHER APART? WITHIN-COUNTRY REGIONAL DISPARITIES AND ADJUSTMENT IN ADVANCED ECONOMIES

Subnational—within-country—regional disparities in real output, employment, and productivity in advanced economies have attracted greater interest in recent years against a backdrop of growing social and political tensions. Regional disparities in the average advanced economy have risen since the late 1980s, reflecting gains from economic concentration in some regions and relative stagnation in others. On average, lagging regions have worse health outcomes, lower labor productivity, and greater employment shares in agriculture and industry sectors than other within-country regions. Moreover, adjustment in lagging regions is slower, with adverse shocks having longer-lived negative effects on economic performance. Although much discussed, trade shocks—in particular greater import competition in external markets—do not appear to drive the differences in labor market performance between lagging and other regions, on average. By contrast, technology shocks—proxied by declines in the relative costs of machinery and equipment capital goods—raise unemployment in regions that are more vulnerable to automation, with more exposed lagging regions particularly hurt. National policies that reduce distortions and encourage more flexible and open markets, while providing a robust social safety net, can facilitate regional adjustment to adverse shocks, dampening rises in unemployment. Place-based policies targeted at lagging regions may also play a role, but they must be carefully calibrated to ensure they help rather than hinder beneficial adjustment.

Introduction

Disparities in economic activity across subnational regions in the average advanced economy have been gradually creeping upward since the late 1980s, undoing some of the marked decline over the previous three decades and mirroring trends in overall income inequality in many advanced economies (Figure 2.1, panel 1).[1,2] Real GDP per capita in the advanced economy region at the 90th percentile is now, on average, 70 percent higher than that in the region at the 10th percentile. Such a wide disparity means that within-country regional differences in economic activity in a number of advanced economies are larger than the average differences between peer countries (Figure 2.2). By contrast, average subnational regional (simply regional hereafter) disparities in emerging market economies have trended down since 2010, after rising from the early 2000s (Figure 2.1, panel 3). On average, though, they remain about double those in advanced economies. In parallel, the average speed of regional convergence in advanced economies has slowed to less than one-half percent per year, while picking up to more than 1 percent in emerging market economies (Figure 2.1, panels 2 and 4).

Slowing regional convergence and rising disparities in some advanced economies, alongside regional labor market and productivity developments, have attracted much interest in recent years, in part because of evidence that poor regional performance within a country can fuel discontent and political polarization, erode social trust, and threaten national cohesion.[3]

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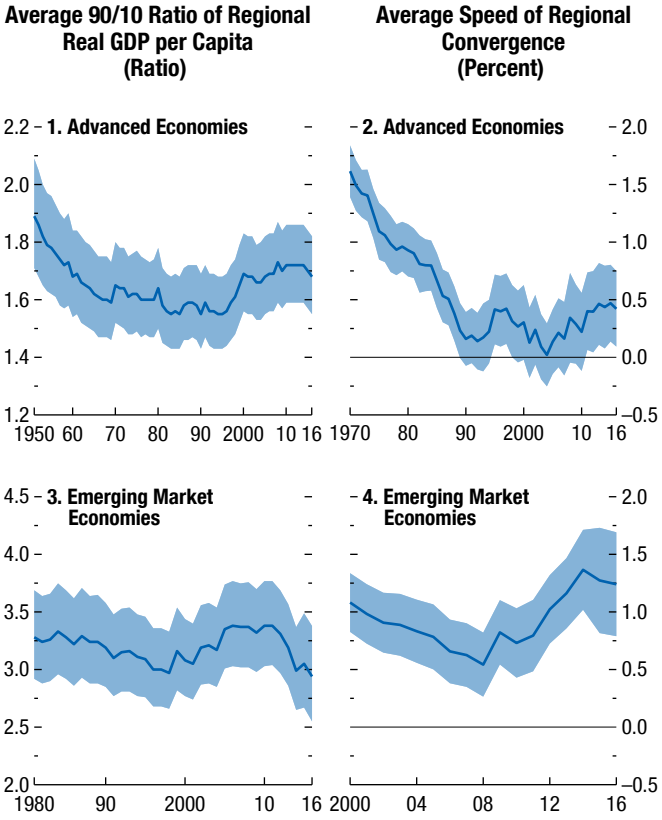
[1]For evidence on trends in overall income inequality in advanced economies, see Dabla-Norris and others (2015); the October 2017 *Fiscal Monitor*; and Nolan, Richiardi, and Valenzuela (2019), among others. Immervoll and Richardson (2011) argues that declining fiscal redistribution accounts for some of this rise.

[2]Subnational regions are the TL2 regions as defined in OECD (2018) unless otherwise indicated. These are typically the first-level administrative units within a country, corresponding roughly to US states or German Länder. Consequently, the geographic extents of TL2 regions are not homogenous across or within countries. Alternative geographic aggregates (for example, higher resolution areal or metropolitan aggregates or different administrative classifications) may generate different findings. Subnational regional real GDP per capita is purchasing power parity (PPP) adjusted for cross-country comparability, although not adjusted for within-country regional price differences. Box 2.1 discusses some of the issues with measuring regional real GDP per capita and its link to welfare.

[3]See Algan and Cahuc (2014) and Guriev (2018) on social trust, regional performance, and rising political polarization. Looking at Europe, Winkler (2019) presents evidence that regional income inequality engenders greater political polarization in regions. Rajan (2019) argues that lack of attention to peripheral regions is fostering despair and a backlash, destabilizing societies.

Figure 2.1. Subnational Regional Disparities and Convergence over Time

Subnational regional disparities in the average advanced economy have risen over the past three decades, while regional convergence has slowed. Disparities in emerging market economies are typically larger but have been coming down, while within-country average convergence has picked up.

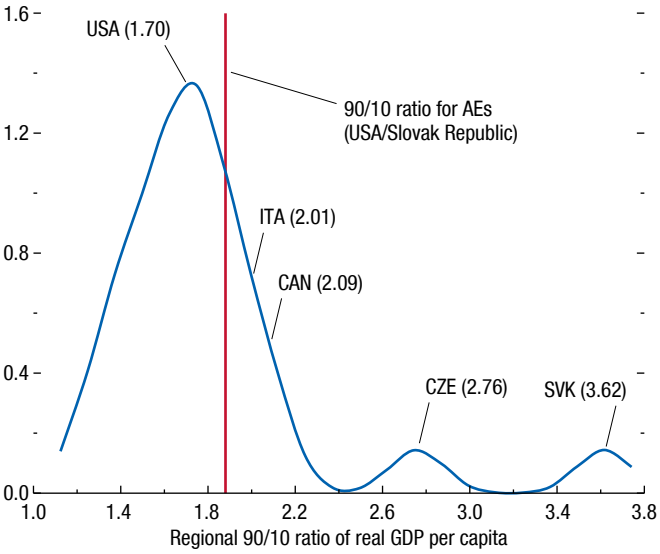


Sources: Gennaioli and others (2014); Organisation for Economic Co-operation and Development Regional Database; and IMF staff calculations.
Note: The regional 90/10 ratio for a country is defined as real GDP per capita in the region at the 90th percentile of the country's regional real GDP per capita distribution over that of the region at the 10th percentile. The solid line in panels 1 and 3 shows the year fixed effects from a regression of regional 90/10 ratios from the indicated sample on year fixed effects and country fixed effects to account for entry and exit during the period and level differences in the 90/10 regional GDP ratios. Blue shaded areas indicate the associated 90 percent confidence interval. Panels 2 and 4 show the coefficient on initial log real GDP per capita from a cross-sectional regression of average real purchasing power parity GDP per capita growth on initial log real GDP per capita, estimated over 20-year rolling windows (plotted at the last year of the window). The regression includes country fixed effects, so it indicates average within-country regional convergence. The coefficient is expressed in annualized terms, indicating the average annual speed of convergence. See Online Annex 2.1 for the country samples.

Figure 2.2. Distribution of Subnational Regional Disparities in Advanced Economies

(Density, 2013)

Many advanced economies have larger within-country regional disparities than exist between advanced economies.



Sources: Organisation for Economic Co-operation and Development Regional Database; and IMF staff calculations.
Note: The figure plots the kernel density of the country-level regional 90/10 ratio across advanced economies (the ratio of real GDP per capita, PPP-adjusted, of the 90th percentile subnational region to the 10th percentile subnational region, calculated for each country). The vertical line indicates the national 90/10 ratio within the same group of advanced economies (that is, the ratio of real GDP per capita, PPP-adjusted of the country at the 90th percentile to the country at the 10th percentile). Selected countries' positions in the distribution are indicated by their International Organization for Standardization (ISO) codes and corresponding regional 90/10 value in parentheses. See Online Annex 2.1 for the country sample.
PPP = purchasing power parity.

More generally, a recurring theme in the latest economic research is that local conditions play an essential role in shaping individual opportunities and social mobility—in other words, place can be primal.[4]

Aside from their political and social ramifications, are disparities in regional economic activity a macroeconomic concern? To be sure, increases in

[4]For example, see Chetty and Hendren (2018a, 2018b) on how place-of-birth has profound and long-lasting effects on an individual's lifetime economic opportunities, even accounting for family background and other influences. Durlauf and Seshadri (2018) argues that causation flows from economic inequality to lower social mobility, rather than the reverse. Drawing on other evidence from the United States, Chetty, Hendren, and Katz (2016) contends that geographic mobility is a key means by which social mobility—improved lifetime incomes and opportunities—can be achieved. See also Conolly, Corak, and Haeck (2019) for similar analyses and evidence from Canada.

disparities between regions of a country can be a normal feature of growth. Increasing specialization and agglomeration—the phenomenon in which the increasing spatial density of economic activity makes trade and exchange more efficient—can boost productivity and lead to a greater concentration of economic activity in some regions within a country, causing them to pull away from others.[5] Growth in core regions can nonetheless eventually spread outward to peripheral regions, generating catch-up.[6]

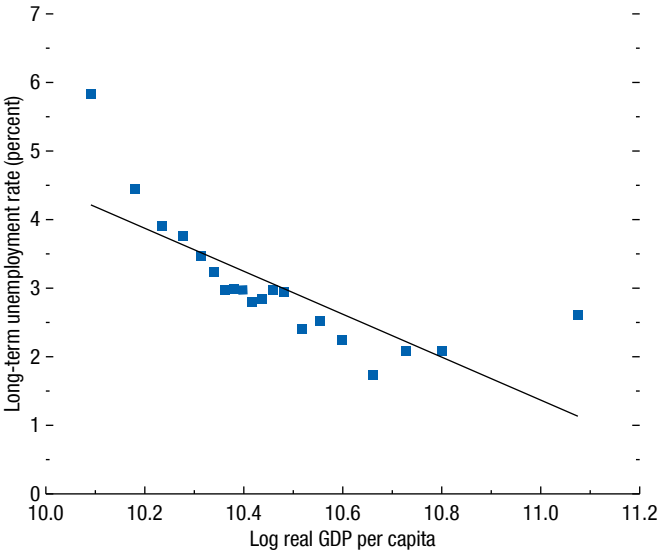
However, persistently large or increasing regional disparities can also be a sign that some regions are not adjusting to changing economic circumstances and are falling behind. Failure to adjust to adverse shocks—contributing to high regional unemployment and persistent shortfalls in productivity—could reflect barriers to labor and capital moving to regions and firms where their returns would be higher. Indeed, long-term unemployment rates tend to be higher in worse-performing regions within advanced economies, suggesting some persistent inefficiencies may be at work (Figure 2.3).

Consistent with the notion that regional disparities can drive social and political discontent, lagging regions in advanced economies—those failing to converge toward richer regions of the same country over the past couple of decades—tend to do worse than other regions, on average, on key measures of well-being, including health, human capital, and labor market outcomes (Figure 2.4).[7] The age profiles of populations in lagging regions may explain part of their overall lower employment rate—lagging regions have significantly lower prime age (ages 25–54) population shares and skew significantly younger (under age 25) than other regions. But these demographic characteristics are not the complete story for lagging regions, as seen by their higher overall unemployment rate and higher youth inactivity rate (share of youth not in employment, education, or training), on average. Given the importance of employment status for life satisfaction, independent of its effect on income, improving regional labor market performance can generate welfare gains beyond those that can be achieved through income redistribution.[8]

Motivated by these considerations and taking into account the greater recent rise in disparities in advanced economies alongside data availability constraints, this chapter examines regional disparities and labor market adjustment in advanced economies, with a focus on the

Figure 2.3. Subnational Regional Unemployment and Economic Activity in Advanced Economies, 1999–2016

Regional long-term unemployment rates tend to be higher where economic activity per person is lower, suggesting the existence of greater inefficiencies in lagging regions.



Sources: Organisation for Economic Co-operation and Development Regional Database; and IMF staff calculations.
Note: The figure illustrates the regression slope for the relationship between regional long-term unemployment rates and log regional real GDP per capita after controlling for country-year fixed effects. Dots show the binned underlying data from the regression, based on the method from Chetty, Friedman, and Rockoff (2014). See Online Annex 2.1 for the country sample.

[5]The underlying impetus for these dynamics may be simple geography (less costly access to trading partners and inputs), natural resource booms, or the persistent effects of historical factors. See Krugman (1991), Davis and Weinstein (2002), Duranton and Puga (2004), Moretti (2011), and Nunn (2014) for further discussion of these mechanisms and drivers.

[6]See Coe, Kelly, and Yeung (2007) and WB (2009) for evidence on these spillovers.

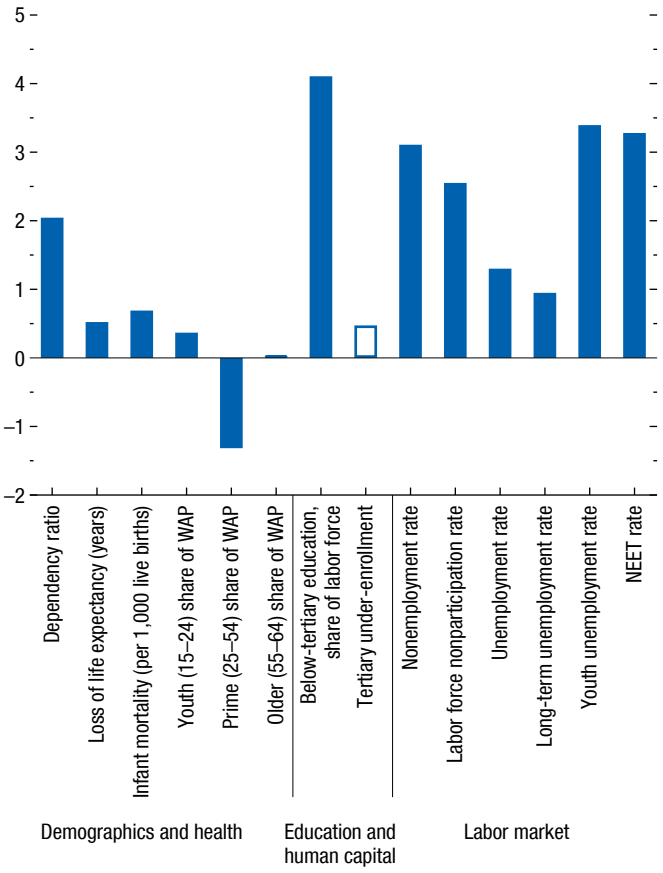
[7]Specifically, lagging regions are defined as those whose real GDP per capita in 2000 was below the country's regional median and whose growth was slower than the country's average from 2000–16. Similar patterns for human capital and labor market outcomes also hold if lagging regions are defined by predetermined criteria, such as below median initial real GDP per capita and initial service sector employment share. Nunn, Parsons, and Shambaugh (2018) finds that US counties that had initially low human capital, were less diversified in production, and were more dependent on manufacturing, had worse health, income, and labor market outcomes. It is important to note that the findings for lagging regions hold, on average; it is possible for a given region to differ from that average behavior. Moreover, due to data availability constraints, as noted, the classification is based on real GDP per capita data from 2000–16. See Online Annex 2.1 for further details. All annexes are available at www.imf.org/en/Publications/WEO.

[8]See Clark and Oswald (1994); Grün, Hauser, and Rhein (2010); and Clark (2018), among others, for evidence on the positive link between employment and happiness, independent of income and job quality.

Figure 2.4. Demographics, Health, Human Capital, and Labor Market Outcomes in Advanced Economies: Lagging versus Other Regions

(Percentage point difference, unless otherwise noted)

Lagging regions tend to have worse health, education, and labor market outcomes than other regions.



Sources: Organisation for Economic Co-operation and Development Regional Database; and IMF staff calculations.

Note: Bars show the difference in lagging regions versus other regions for each of the variables. Results are based on regressions of each variable on an indicator for whether a region is lagging or not, controlling for country-year fixed effects and with standard errors clustered at the country-year level. Solid bars indicate that the estimated coefficient on the lagging indicator is statistically significant at the 10 percent level. Variables are defined so that positive estimated coefficients indicate worse performance by lagging regions. Tertiary under-enrollment is the difference in the percent of population enrolled in tertiary education in other regions versus lagging regions. The nonemployment rate is defined as 100 minus the employment rate (in percent). The labor force nonparticipation rate is defined as 100 minus the labor force participation rate of the working-age (ages 15–64) population (in percent). The unemployment rate is the share of the working-age labor force that is unemployed. The long-term unemployment rate is the share of the working-age labor force that has been unemployed for one year or more. The youth unemployment rate is the share of the youth (ages 15–24) labor force that is unemployed. The NEET rate is the percent of the youth population that is not in education, employment, or training. Lagging regions are defined as those with real GDP per capita below their country median in 2000 and with average growth below the country's average over 2000–16. NEET = not in education, employment, or training; WAP = working-age population. See Online Annex 2.1 for the country sample.

characteristics and dynamics of lagging regions since 2000. It also explores whether differences in national policies related to labor and product market functioning influence regional disparities and adjustment. Specifically, the chapter investigates the following questions:

- How different are advanced economies in the extent of their regional disparities in economic activity? How do regional differences in sectoral production account for variation in labor productivity across regions within countries? How do lagging regions compare with other regions in their sectoral mix of employment and productivity? How effective have lagging regions been in responding to trends in the sectoral reallocation of labor?
- What are the regional labor market effects of local labor demand shocks—in particular trade and technology shocks—in advanced economies? Is adjustment to these shocks in lagging regions different from that in other regions?
- Do national policies and distortions play a role in regional disparities and adjustment in advanced economies?

The chapter's main findings are the following:

- The extent of regional disparities differs markedly across advanced economies—with the 90/10 ratios for regional real GDP per capita ranging from about 1.3 to more than 3. Underlying these disparities are regional differences in sectoral labor productivities and the sectoral employment mix, with lagging regions, on average, being systematically less productive and more specialized in agriculture and industry.
  - Intrinsic sectoral productivity differences across regions tend to drive most regional labor productivity differences within a country. But for lagging regions, the employment mix matters more than it does for other regions.
  - Even controlling for differences in trends across countries, lagging regions' employment is more concentrated in agriculture (suggesting that some are more rural) and industry, and less in services. Moreover, labor productivity across sectors is systematically lower in lagging regions than in others.
  - From the early 2000s to the mid-2010s, one-third of the increase in the overall labor productivity gap between lagging and other regions appears to have reflected relatively ineffective sectoral labor market adjustment in lagging regions, with the rest attributed to growing sectoral productivity differences.

- Adverse trade and technology shocks affect more exposed regional labor markets, but only technology shocks tend to have lasting effects, with even larger unemployment rises for vulnerable lagging regions, on average.
  - Increases in import competition in external markets associated with the rise of China's productivity do not have marked effects on regional unemployment, although labor force participation falls in the near term, but quickly abates. Conditions in lagging regions do not look very different from other regions after such shocks.
  - By contrast, differences in vulnerability to automation across regions translate into noticeable differences in labor market responses to capital goods prices. When machinery and equipment prices fall, more vulnerable regions see more persistent rises in unemployment and declines in labor force participation than do less vulnerable regions. More vulnerable lagging regions have even larger rises in unemployment rates. Out-migration from more vulnerable lagging regions also appears to drop, suggesting that adjustment to technology shocks through labor mobility may be weaker in lagging regions that are more vulnerable to automation pressures.
- National structural policies that encourage more open and flexible markets are associated with improved regional adjustment to shocks and a lower dispersion of firms' efficiencies in allocating capital, which may narrow regional disparities.
  - Less stringent employment protection regulations and less generous unemployment benefits are associated with milder unemployment effects of trade and technology shocks.
  - National policies that encourage more open and flexible product markets are associated with lower variability in firms' capital allocative efficiencies, which is associated with lower regional disparities.

This chapter documents patterns and associations between regional disparities and adjustment and national policies in advanced economies. This is intended to help inform debate and discussion, complementing the vast literature examining regional differences on a country-by-country basis.[9] Much of the chapter's analysis focuses on the relatively short period since 2000 for which broad, cross-country regional data are available, enabling a look at labor market adjustment but precluding study of longer-term regional development dynamics. Furthermore, regions in the analysis are typically defined as countries' first-level administrative units, which are economically and politically meaningful within countries and for which good data coverage is available (see also footnote 2). However, this means that regions as diverse in size as Texas and Rhode Island in the United States are pooled together, despite the very different potential extents of their within-region markets for adjustment. Although the analysis attempts to account for this diversity through the inclusion of a variety of controls, alternative levels of geographic aggregation could generate different findings. Robustness checks are undertaken to confirm that the stylized facts and analysis results hold excluding capital-intensive, resource-rich regions. Finally, given that national policies may be affected by many different variables, their estimated effects on regional adjustment should be interpreted as associational rather than causal.

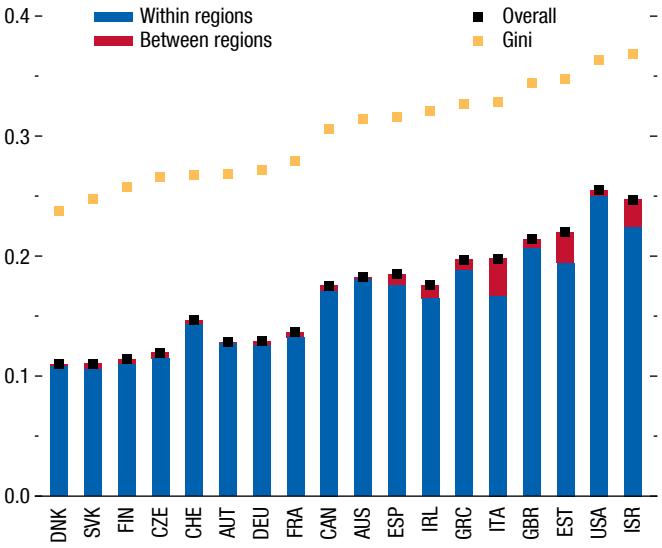
Although regional differences in economic activity and labor market outcomes are substantial within advanced economies, analysis of overall household-level inequality in disposable incomes at the country-level suggests that its regional component is small (Figure 2.5; see also Box 2.1 for a discussion of the measurement of regional economic activity and welfare).[10] For the subset of advanced economies and years since 2008 for which the decomposition can be calculated, the regional component of household disposable income inequality ranges from less than 1 percent in Austria to about 15 percent in Italy. This means that for advanced economies, further reducing differences in average disposable income across regions would typically have only moderate effects on income inequality in a country. However, there are some important exceptions. If, for example, average regional differences were eliminated in Italy, its income inequality could drop to levels seen in the early 1990s, which

[9]For a selection of work examining or leveraging regional economic differences in specific countries, see, for example, Kaufman, Swagel, and Dunaway (2003) and Breau and Saillant (2016) on Canadian provincial differences; Bande, Fernández, and Montuenga (2008), IMF (2018), and Liu (2018) on Spanish regional differences; Felice (2011), Giordano and others (2015), and Boeri and others (2019) on Italian regional differences.

[10]See Shorrocks and Wan (2005), Novotný (2007), and Cowell (2011), which come to broadly similar conclusions with alternative personal income concepts and multiple decomposable income inequality metrics. A similar finding holds using pretax and pretransfer household income. Note that household disposable income differs from GDP in that it incorporates factor income flows to/from elsewhere and the effects of fiscal redistribution.

Figure 2.5. Inequality in Household Disposable Income within Advanced Economies
(Indexes)

The regional component of income inequality in most advanced economies is relatively small, accounting for only about 5 percent of overall country inequality, on average.



Sources: Luxembourg Income Study; and IMF staff calculations.
Note: The overall index shown is the generalized entropy index, also known as Theil's L, or the mean log deviation index of inequality. The income measure used is equivalized household disposable income (household income after tax and transfers transformed to account for household size differences), by country in the latest available year after 2008. The height of the bar indicates the overall level of the income inequality index, which is then decomposed into two components: (1) inequality attributable to average income differences across regions (the between component), and (2) inequality attributable to income differences across households within regions, after adjusting for average regional income differences (the within component). The Gini index of income inequality is also shown for comparison, as a more familiar inequality measure (but that is not decomposable). Data labels use International Organization for Standardization (ISO) country codes.

were the lowest since the 1970s.[11] But, as discussed above, reducing regional disparities and improving performance in economic activity and employment can have important consequences beyond current income. Moreover, some evidence indicates that countries with larger regional disparities may experience lower long-term growth (Che and Spilimbergo 2012).

The chapter begins with a brief discussion of how to think about regional development and adjustment. The subsequent section presents evidence on patterns of regional disparities in advanced economies and how lagging regions differ from others. Then, the regional responses to local labor demand shocks arising from trade and technology shocks are examined, focusing on how lagging regions differ and how national labor market policies may influence regional adjustment. The chapter then presents some evidence on labor mobility and the effects of national policies on regional disparities in the effectiveness of factor reallocation. Finally, a summary and concluding thoughts consider the potential implications for policies, including place-based policies.

Regional Development and Adjustment: A Primer

As in the large body of literature on the drivers of cross-country economic differences, the causes of persistent regional disparities within countries are hotly debated.[12] However, unlike countries, regions within a country are typically subject to the same overarching institutional structure (both political and economic) and common, national policies, with free exchange of goods and services and no legal impediments to the movements of capital and labor across the country.[13] Under perfectly competitive output and input markets and no market frictions (such as barriers to cross-regional factor movements), capital and labor would flow within and across regions to equalize marginal returns of capital and

[11]Based on the historical path of Italy's Gini coefficient from Atkinson and others (2017) and the assumption that the Gini would decline in proportion to the decline in the mean log deviation or generalized entropy index (Theil's L; which is a decomposable income inequality measure) if the regional component were eliminated.

[12]The development accounting framework (Caselli 2005; Hsieh and Klenow 2010) is often used to organize the potential drivers of regional differences within a country into proximate (physical capital, labor and human capital, and total factor productivity) and other intermediate and ultimate determinants (such as policies, culture, institutions, geography, climate, luck). Based on the analysis of global samples, Acemoglu and Dell (2010) and Gennaioli and others (2013, 2014) argue for the critical importance of human capital for development. Lessmann and Seidel (2017) also points to the importance of mobility and trade openness for regional development. Hsieh and Moretti (2019) contends that economies arising from regional agglomeration are substantial and that regional zoning restrictions lowered US aggregate output growth by one-third from the 1960s through the 2000s. Rodríguez-Pose and Storper (2019) pushes back against Hsieh and Moretti's (2019) contention, arguing that housing price differences across regions are not the primary drivers of regional migration. Rodríguez-Pose and Ketterer (forthcoming) asserts that regional differences in governance quality within-country lead to persistent differences in regional development and performance. See also OECD (2016b; 2018) for further analysis and evidence on broad patterns and drivers of persistent regional disparities across a wide range of countries.

[13]There are exceptions—often in federal states—where free exchange and movement within countries are inhibited. For example, Canadian provinces and territories differ in their standards and regulations for some goods and services, de facto restricting interprovincial trade (Alvarez, Krznar, and Tombe 2019).

labor within a country, even if differences in regional total factor productivity were persistent. For instance, workers would move to regions with the highest returns to labor, and hence wages, pushing down wages in the destination region over time. At the same time, lower labor supply in source regions where wages are relatively low would, in turn, help raise wage rates there, facilitating convergence of labor productivities.

Nonetheless, such an efficient allocation of factors across regions can be consistent with differences in regional real GDP per capita if, for example, labor is differentiated by skill level.[14] In practice though, markets may be neither perfectly competitive nor friction-free across regions, leading to diminished efficiency, misallocation of factors across regions, and hampered adjustment to shocks. Labor mobility may be constrained or evident only among the highly skilled, leading to more persistent regional unemployment in response to adverse shocks.[15]

The propensities for economic activity to cluster in space (agglomeration economies) and for productivity to rise with the density of skilled workers (human capital externalities) can also generate divergence if differences in production costs and the concentration of skills across regions are large enough.[16] Although these features may suggest the presence of market failures (that is, inefficient barriers to regions growing even more concentrated), their implications for optimal policies are ambiguous.[17] Overall social welfare could actually be larger if lagging regions were given help to create their own virtuous cycles of growing agglomeration economies, rather than be depopulated through population shifts to leading regions. Given these ambiguities and the more general difficulty of quantifying the relative importance of efficient versus inefficient allocation in driving regional disparities, the chapter focuses on lagging regions and their characteristics and adjustment.

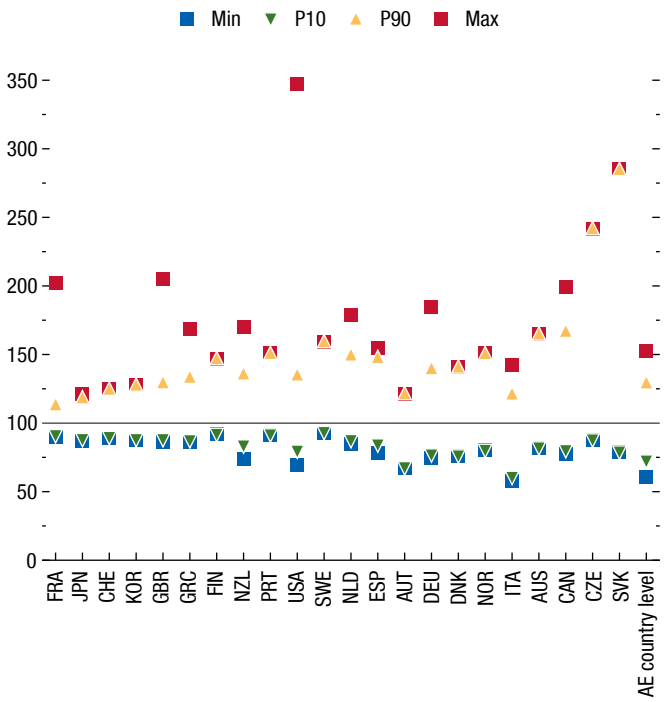
Patterns of Regional Disparities in Advanced Economies

The extent of regional disparities in economic activity varies widely across advanced economies (Figure 2.6). For example, Japan's regional differences are relatively narrow, with real GDP per capita of the region at the 90th percentile only about 30 percent higher than

Figure 2.6. Subnational Regional Disparities in Real GDP per Capita

(Ratio to regional median times 100, 2013)

The extent of regional disparities differs widely across advanced economies.



Sources: Organisation for Economic Co-operation and Development (OECD) Regional Database; and IMF staff calculations.
Note: P10(50, 90) indicates the 10(50, 90)th percentile of the regional real GDP per capita (purchasing power parity-adjusted) distribution within the country. Countries are sorted by the ratio of the within-country 90th percentile to the 10th percentile of regional real GDP per capita. Regional medians (P50) by country are normalized to 100, with other percentiles and the maximum and minimum shown relative to the median by country. Underlying regions are OECD territorial level 2 entities. The sample includes 22 advanced economies (all countries with four or more regions). The AE country level shows the corresponding quantiles calculated over the country-level sample of advanced economies. AE = advanced economies. Data labels use International Organization for Standardization (ISO) country codes.

[14]For example, if labor and human capital are differentiated (such as high skill/low skill), then total factor productivity differences may entail differences in the human capital composition of the workforce, affecting output per worker. If technology differs across regions, this may also lead to differences in output per worker across regions even if marginal returns to factors are equalized.

[15]See Kim (2008) and Duranton and Venables (2018) for evidence and arguments.

[16]See Krugman and Venables (1995); Fujita, Krugman, and Venables (1999); and Gennaioli and others (2013) on how increasing returns from agglomeration economies and human capital externalities can manifest in spatial economic models.

[17]See Austin, Glaeser, and Summers (2018) for further discussion of the ambiguous implications of agglomeration economies. As noted earlier, Hsieh and Moretti (2019) argues that housing and zoning restrictions present substantial barriers to beneficial agglomeration in the United States, lowering welfare and increasing spatial wage dispersion. However, Giannone (2018) suggests that the bulk of the increase in spatial wage dispersion in the United States over the past 40 years is due to skill-biased technological change rather than agglomeration.

that of the 10th percentile region. France has a similar 90/10 ratio, but with a notable better-performing outlier region (centered on the capital Paris) that has about double the real GDP per capita of the median French region. The United States has a 90/10 ratio which is about average for advanced economies, but it also shows greater dispersion in the tails of the distribution, with even more extreme regional outcomes than average (the District of Columbia's regional real GDP per capita is more than three times that of the median US region, while Mississippi's is about one-third lower than the median). Among the advanced economies with larger regional differences are Canada and Italy, with 90/10 ratios at about 2.

Regional labor productivity—output per worker—is closely related to regional real GDP per capita. A shift-share analysis of regional labor productivity provides insights into the relative importance of differences in sectoral labor productivities, sectoral employment shares, and the allocation of workers to more or less productive sectors in accounting for regional disparities within a country (Figure 2.7).[18] For most advanced economies, the bulk of regional variation in labor productivity appears to be due to sectoral labor productivity differences across regions rather than the sectoral employment mix—in other words, intrinsic sectoral productivity differences across regions tend to be the most important. However, Greece, Italy, Korea, and Portugal are notable examples in which other components explain the overall regional variation. In these cases, simply reallocating regional employment across sectors (holding sectoral productivity differences constant) could substantially lower regional variability in labor productivity.

The greater presence of lagging regions does not appear to be systematically related to differences in the drivers of regional variation across countries. About 20 percent of regions in advanced economies are classified as lagging, with the distribution differing across countries. That said, analysis suggests that the sectoral employment mix has been more influential in driving regional differences for lagging regions compared to others, consistent with the view that labor markets in lagging regions may be reallocating employment across sectors less effectively than other regions.[19]

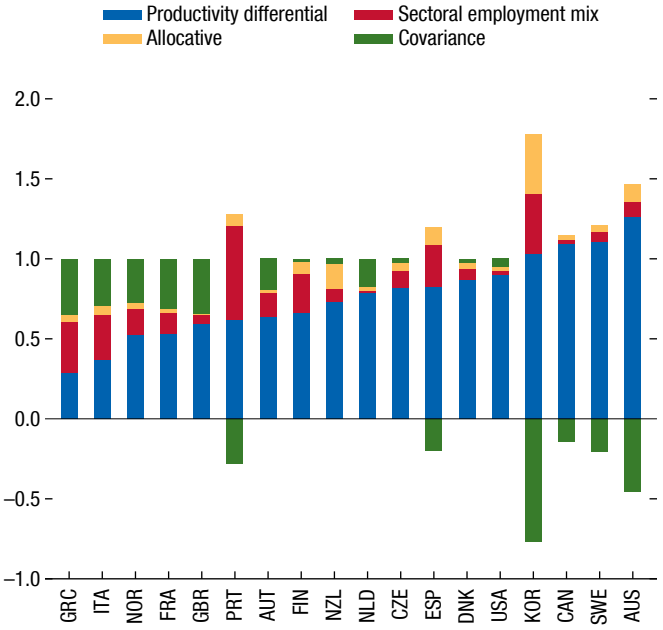
[18]For the variance decomposition of the shift-share analysis, there is an additional fourth term equal to the sum of the covariances across the three components described here. See Esteban (2000) and Online Annex 2.3 for further details on the calculation.

[19]See Online Annex 2.3 for further details.

Figure 2.7. Shift-Share Variance Decomposition, by Country, 2003–14

(Share of overall average regional variance)

For most advanced economies, much of the regional variation in labor productivity can be attributed to differences in sector productivity across regions.

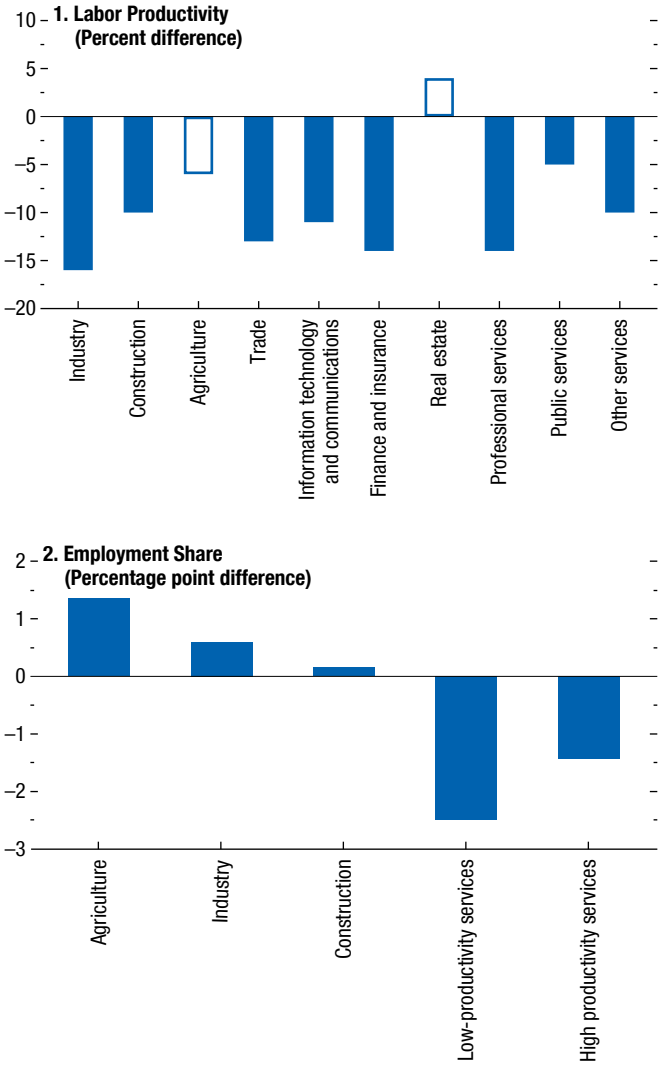


Sources: Organisation for Economic Co-operation and Development (OECD) Regional Database; and IMF staff calculations.
Note: The figure illustrates the shift-share analysis and variance decomposition for regional differences by country from Esteban (2000), sorted according to the share of the overall average regional variance explained by regional productivity differentials across sectors. For further details, see Online Annex 2.3. The sample includes 18 advanced economies (all countries with five or more regions at the OECD territorial level 2), from 2003–14. For all countries, the 10-sector ISIC Revision 4 classification of the OECD regional database is used (see Online Annex 2.1 for details). Bars sum up to 1 (overall average regional variance by country). Data labels use International Organization for Standardization (ISO) country codes.

Lagging regions also have significantly lower labor productivities across sectors than do other regions (Figure 2.8, panel 1). These range from about 5 percent less in public services, to about 15 percent less in industry and finance and professional services. This lower productivity for lagging regions could reflect a mix of poorer characteristics, such as lower human capital—something highlighted as essential in much work on regional development, including Acemoglu and Dell 2010 and Gennaioli and others 2013, 2014—and less efficient labor allocation across sectors. It may also reflect poorer quality of complements to labor in lagging regions, such as connective infrastructure, which has been identified as important in development in some

Figure 2.8. Sectoral Labor Productivity and Employment Shares: Lagging versus Other Regions

Lagging regions tend to have lower labor productivity across sectors and higher shares of employment in agriculture and industry sectors, with lower shares of employment in services.



Sources: Organisation for Economic Co-operation and Development Regional Database; and IMF staff calculations.
Note: Lagging regions in a country are defined as those with real GDP per capita below the country's regional median in 2000 and with average growth below the country's average over 2000–16. Panel 1 shows the estimated difference in sectoral labor productivity in lagging versus other regions. All models control for country-year fixed effects with standard errors clustered at the country-year level. Solid bars indicate statistical significance at the 10 percent level while hollow bars do not. Panel 2 shows the estimated difference in sectoral employment shares between lagging and other regions. High productivity service sectors are finance and insurance, information technology and communications, and real estate. All other service sectors are low-productivity service sectors. See Online Annex 2.1 for the country sample.

studies (Allen and Arkolakis 2014; Donaldson and Hornbeck 2016). Box 2.2 presents evidence that local climate also plays a role, and that climate change may exacerbate differences in productivity between lagging and other regions in advanced economies.

In addition to being less productive, lagging regions, on average, are also significantly likelier to have employment more concentrated in agriculture and industry than in services, including the high productivity growth service sectors of information technology and communications and finance (Figure 2.8, panel 2). In other words, lagging regions, on average, tend to be more rural and have employment more reliant on sectors with lower potential for productivity growth.[20]

A simple counterfactual exercise supports the view that sectoral labor allocation plays an important role in the relative performance of regions (Figure 2.9). In advanced economies from 2002 to 2014, the average labor productivity of lagging regions as a percentage of the labor productivity of other regions declined by about 5 percent, reflecting the evolution of both sectoral labor productivities and employment shares. If only sectoral labor productivity changes were operative, with no change in employment shares, the ratio would still have declined, but by about one-third less than it did. In other words, rather than mitigating the relative decline in overall labor productivity for lagging regions, the shift in sectoral labor allocation appears to have exacerbated it.

Regional Labor Market Adjustment in Advanced Economies

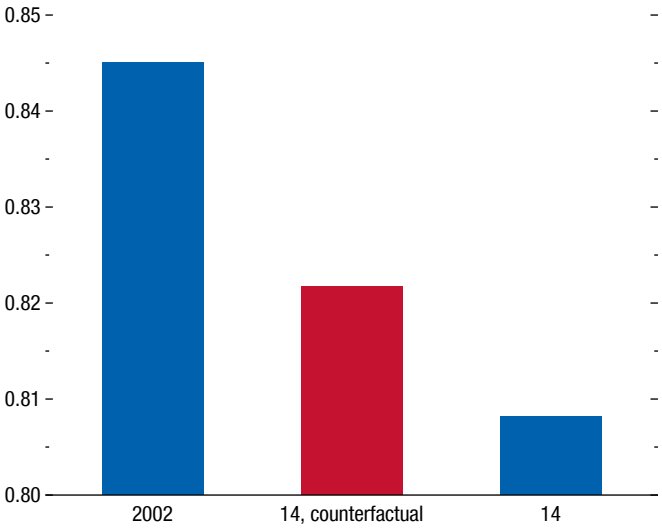
To get a better sense of how differences in regional performance may reflect differences in shocks and responses to shocks, the chapter investigates the effects of adverse local labor demand shocks on regional unemployment and migration.[21] If sectoral

[20]See Chapter 3 of the April 2018 *World Economic Outlook* (WEO) for how structural change in advanced economies and the (in)ability to shift into highly productive service sectors may impact inequality.

[21]There has been a host of work in this vein, inspired by Blanchard and Katz's (1992) early work on US regional labor market dynamics and convergence. Decressin and Fatás (1995) contrasts US and European regional dynamics, finding less of a common component for employment and less migration in response to shocks in Europe. More recently, Dao, Furceri, and Loungani (2017) updates the analysis by Blanchard and Katz (1992) for the United States with improved and more recent data, finding that labor mobility has declined.

Figure 2.9. Labor Productivity: Lagging versus Other Regions
(Ratio)

The overall productivity difference between lagging and other regions has grown, with about one-third due to poor allocation of labor across sectors and the rest to worsening sectoral productivity differences.



Sources: Organisation for Economic Co-operation and Development Regional Database; IMF staff calculations.
Note: Bars show the average country ratio of labor productivity (defined as real gross value-added per worker) in lagging regions to that of other regions in 2002 and 2014 across advanced economies. In the counterfactual scenario, sectoral employment shares are held constant at their 2002 levels while sectoral productivities are set at their realized values. Lagging regions in a country are defined as those with real GDP per capita below the country's regional median in 2000 and with average growth below the country's average over 2000–16. See Online Annex 2.1 for the country sample and Online Annex 2.4 for further details on the calculation.

labor reallocation in a region functions effectively, regional unemployment and participation should be largely shielded from adverse shocks, while migration flows and within-region sectoral employment shifts to absorb them. The critical insight that regional differences in the preexisting sectoral employment mix translate into regional differences in exposure to external shocks enables region-level shocks to be constructed.[22] Two particular types of local labor demand shocks are considered. They attempt to capture some of the much-discussed drivers of trade and technology:[23]

- A shock from increased import competition in external markets that is associated with the rise of China's productivity (Autor, Dorn, and Hanson 2013a, 2013b).[24]
- A shock based on the interaction between a region's vulnerability to automation and the costs of machinery and equipment capital goods (building upon Autor and Dorn 2013; Chapter 3 of the April 2017 WEO; Das and Hilgenstock 2018; and Lian and others 2019).

In general, the findings point to regional labor markets having sluggish adjustment and reallocation in response to negative shocks in advanced economies.[25] Moreover, even though the incidence of these shocks is actually somewhat lower for lagging than other regions (see Online Annex 2.5), some evidence, detailed below, suggests that lagging regions do suffer more in response to some shocks.

Shocks from increasing import competition in external markets from China's economic rise do not have marked average effects on regional unemployment in a broad sample of advanced economies, although they do tend to reduce labor force participation after one year, but this quickly abates (Figure 2.10). The responses of

[22]First conceptualized and used by Bartik (1991), this insight for the construction of plausibly exogenous regional shocks based on preexisting regional differences in exposure to aggregate drivers was then popularized in the field of regional development and adjustment by Blanchard and Katz (1992) and for trade by Topalova (2010). Goldsmith-Pinkham, Sorkin, and Swift (2019) presents a critical evaluation of these kind of instruments.

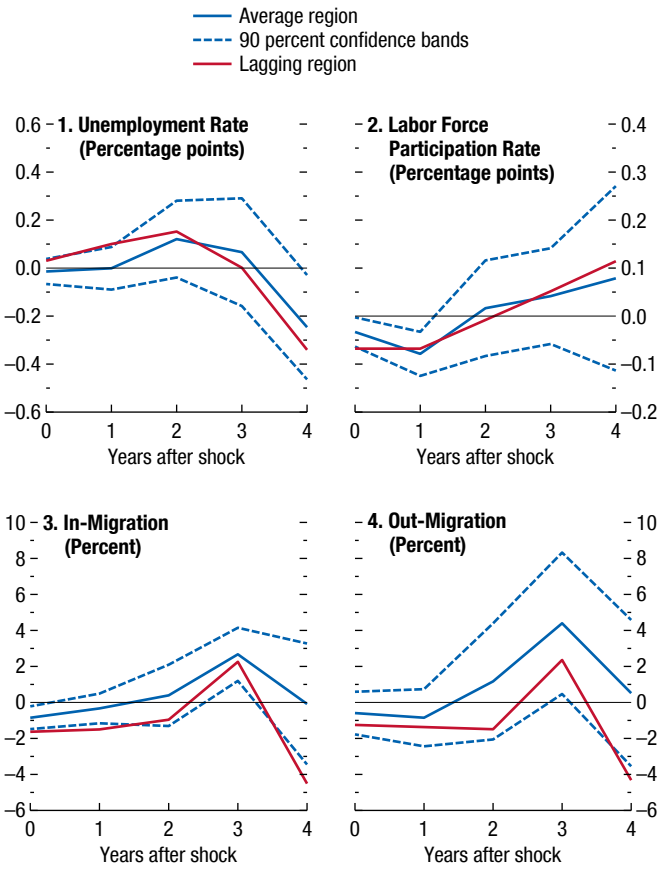
[23]For recent work on the roles of trade and technology in driving disparities and other trends, see Jaumotte, Lall, and Papageorgiou (2013); Karabarbounis and Neiman (2014); Dabla-Norris and others (2015); Autor, Dorn, and Hanson (2015); Helpman (2016); Abdih and Danninger (2017); Dao and others (2017); and Chapter 2 of the April 2018 WEO, among others.

[24]Although the trade shock associated with China's rising productivity has been well studied, it is by no means the only trade shock for advanced economies. In general, advanced economies have faced increasing competition as emerging market economies have become more productive and engaged in international markets.

[25]See Online Annex 2.5 for further details on the construction of the shocks and the regression model specification and estimation. The dynamic responses of regional unemployment and labor force participation rates, and inward and outward migration, are estimated using the local projection method (Jordà 2005), controlling for lagged regional real GDP per capita, lagged regional population density (helping to capture the degree of urbanization), lagged country real GDP per capita, and region-specific and year fixed effects. Although the analysis controls for many regional characteristics through region-specific fixed effects (capturing time-invariant characteristics of regions, including geography and membership in a federation) and lagged regional real GDP per capita (proxying for many aspects of regional development), unobserved time-varying regional variables, such as the extent of cross-regional fiscal redistribution, may also impact adjustment and reallocation. The findings therefore represent the average effects of the shocks within the sample, given the existing distribution of unobservables. Changes in the distribution of unobservables could entail changes in the effects of the shocks.

Figure 2.10. Regional Effects of Import Competition Shocks

Greater competition in external markets tends to raise unemployment in the near term for exposed regions, with little difference between lagging and other regions. But this rise unwinds as regions adjust relatively quickly.



Source: IMF staff estimations.
Note: The blue and red solid lines plot the impulse responses of the indicated variable to a one standard deviation import competition shock, defined as the growth of Chinese imports per worker in external markets weighted by the lagged regional employment mix. Impulse responses are estimated using the local projection method of Jordà (2005). Horizon 0 is the year of the shock. Lagging regions in a country are defined as those with real GDP per capita below the country's regional median in 2000 and with average growth below the country's average over 2000–16. See Online Annex 2.1 for the country sample and Online Annex 2.5 for further details about the shock definition and econometric specification.

lagging regions do not look very different from those of other regions. This stands in contrast to recent literature examining more highly localized labor markets in specific countries. For example, Autor, Dorn, and Hanson (2013a) finds significant adverse local effects on employment for the United States from a similarly defined shock. Applying a similar approach over a similar period, Dauth, Findeisen, and Suedekum (2014) estimates an overall positive net employment effect of the rise in trade for Germany. These studies suggest that the regional effects of trade may vary across countries. However, the results presented here are not inconsistent with these studies, given that they reflect the average regional effect within countries for the group of advanced economies, rather than country-specific responses. Moreover, the analysis here is undertaken at a higher level of regional aggregation and over a later period (post-1999).

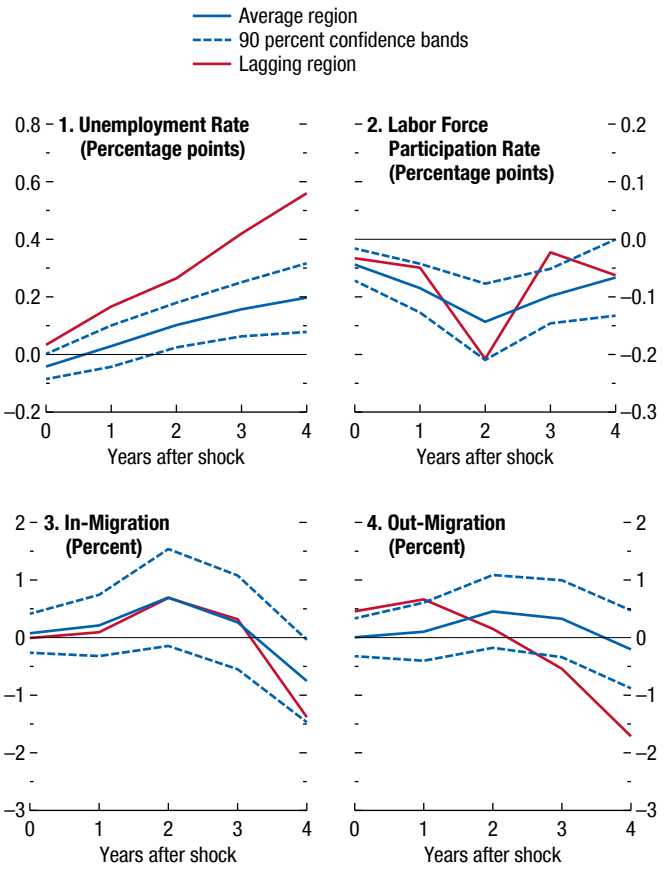
By contrast, adverse shocks to local labor demand arising from technological change have noticeable and persistent effects on labor markets (Figure 2.11). Although there is little sign of an impact effect, unemployment rates in regions more vulnerable to automation rise steadily over the following four years—a pattern consistent with a gradual substitution of capital for labor. The absence of much change in gross migration flows over the near term indicates that labor mobility across regions is low after automation shocks. For lagging regions that are more vulnerable to automation, the rise in unemployment rates is even larger and statistically significantly different from that of other regions. Moreover, unlike other regions, more vulnerable lagging regions see a persistent and statistically significant drop in out-migration after an automation shock, suggesting that workers in these regions may find it harder to move than if they were in other regions. Box 2.3 studies the regional effects of automotive manufacturing plant closures, which may ultimately be driven by trade or technology shocks, finding similarly persistent increases in unemployment, which tend to be worse in regions where gross migration flows are lower.

Can national labor market policies and distortions inhibit regional labor market adjustment? They might if they contribute to more rigid regional labor markets, leading adverse shocks to have more long-lived effects on unemployment and participation.[26] The following discussion examines how the calibration of two national labor market policies—the stringency of employment protection regulations and the generosity of unemployment insurance schemes—influence regional labor market responses to local shocks. More stringent employment protection regulation will tend to reduce job destruction, dampening the likelihood of layoffs, but also job creation and the hiring rate, as employers recognize that new hires come with the potential cost of more sluggish adjustment in

[26]An example of a national structural policy that alters the functioning of regional labor markets is presented in Boeri and others (2019), which compares the regional effects of Italy's and Germany's national collective bargaining systems.

Figure 2.11. Regional Effects of Automation Shocks

Falling machinery and equipment prices tend to raise unemployment in regions where production is more vulnerable to automation, with exposed lagging regions hurt even more. Out-migration stalls or drops for more exposed lagging regions.



Source: IMF staff estimations.
Note: The blue and red solid lines plot the impulse responses of the indicated variable to an automation shock, defined as a one standard deviation decline in machinery and equipment capital price growth for a region that experiences a one standard deviation rise in its vulnerability to automation (Autor and Dorn 2013; Lian and others 2019). Horizon 0 is the year of the shock. Lagging regions in a country are defined as those with real GDP per capita below the country's regional median in 2000 and with average growth below the country's average over 2000–16. See Online Annex 2.1 for the country sample and Online Annex 2.5 for further details about the shock definition and econometric specification.

downturns. Whether unemployment rises in response to adverse shocks depends on which of these two forces dominates, which is theoretically ambiguous (Pissarides 2001). Unemployment insurance provides security against income shocks from job loss, but can also impact the dynamics of unemployment through its impacts on an individual's job search efforts and job quality with reemployment (Chetty 2008; Tatsiramos and van Ours 2014; Schmieder, von Wachter, and Bender 2016).

Analysis suggests that national policies do matter for regional labor market adjustment—they may exacerbate or dampen adverse unemployment effects, although their impact varies across outcomes and shocks (Figure 2.12). Moreover, the findings should be interpreted as associational, given that national policies are only considered one-by-one, rather than jointly. That means that the change in regional responses associated with national employment protection and unemployment benefits policies may incorporate the influence of correlated national policies that are not included in the analysis.

More stringent national employment protection is associated with greater regional unemployment effects from import competition and automation shocks. Automation shocks are also associated with higher unemployment in the near term, where benefits are greater, suggesting that the incentive effects of greater benefits do make unemployment more persistent, although the difference vanishes at longer horizons. Responses to import competition shocks meanwhile show little difference between more versus less generous unemployment benefit regimes. The overall takeaway from these findings is that national policies that encourage more flexible labor markets may ease adjustment and reallocation in regional labor markets, improving their resilience to shocks.

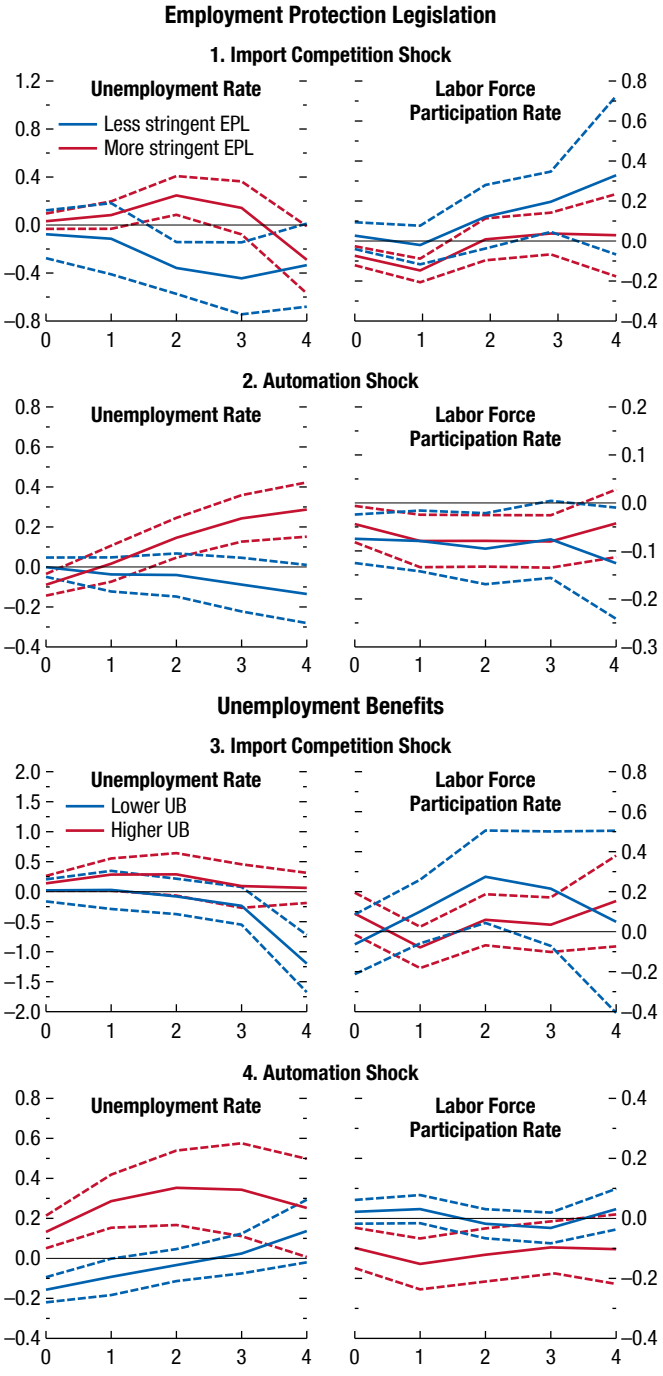
Regional Labor Mobility and Factor Allocation: Individual and Firm-Level Evidence

As noted, regional adjustment to shocks depends on the effectiveness of factor reallocation—the ability of capital and labor to move across sectors, firms, and space, toward their most productive use. Where factor mobility within and across regions is hampered or reallocation ineffective, negative shocks may have prolonged effects, contributing to poorer performance in some regions and exacerbating disparities within a country. This section examines differences in labor mobility between lagging regions and others, the characteristics of regional migrants, and the differences across regions in the efficiency with which firms allocate capital—the sensitivity of their investments to the marginal returns to capital.

Lagging regions, on average, have lower gross migration flows (inward or outward) than other regions. This suggests that their labor reallocation mechanisms are less powerful, given that lagging regions are actually less likely than other regions to experience

Figure 2.12. Regional Effects of Trade and Technology Shocks Conditional on National Policies
(Percentage points)

Regional adjustment to adverse trade and technology shocks tends to be faster in countries with policies supporting more flexible labor markets.



Source: IMF staff estimations.
Note: Years after impact on *x*-axis. Less (more) stringent/low (high) = 25th (75th) percentile of the indicated variable. EPL = Index of employment protection legislation; UB = gross replacement rate of unemployment benefits. Dashed lines indicate the 90 percent confidence bands. See Figures 2.10 and 2.11 for definitions of the import competition and automation shocks. See Online Annex 2.5 for detailed definitions of import competition and automation shocks and Online Annex 2.1 for country samples.

shocks (Figure 2.13, panel 1).[27] The better educated (either upper secondary or tertiary education) or employed are more likely to move within countries (Figure 2.13, panels 2 and 3). Those facts are consistent with migration being more constrained in lagging regions, where unemployment tends to be higher and education and skills lower.

For another perspective on factor allocation across regions within a country, differences in firms' allocative efficiency across regions of a country are analyzed. Allocative efficiency is measured at the firm level by the responsiveness of their investment (capital growth) to the firm's marginal return on an additional unit of capital (captured by the marginal revenue product of capital), after accounting for a host of region-sector-country-year differences. These firm-level estimates are then mapped to the region-country-sector-year, enabling the construction of their distribution across regions by country, sector, and year. Analysis shows that greater variability in firms' allocative efficiency across regions within a country—as captured by the ratio of the standard deviation to the mean allocative efficiency by country-sector-year—is correlated with greater regional disparities in economic activity. In essence, when regional differences in firms' responsiveness to marginal returns to capital are large, the spread in regional performance also tends to be wider.[28]

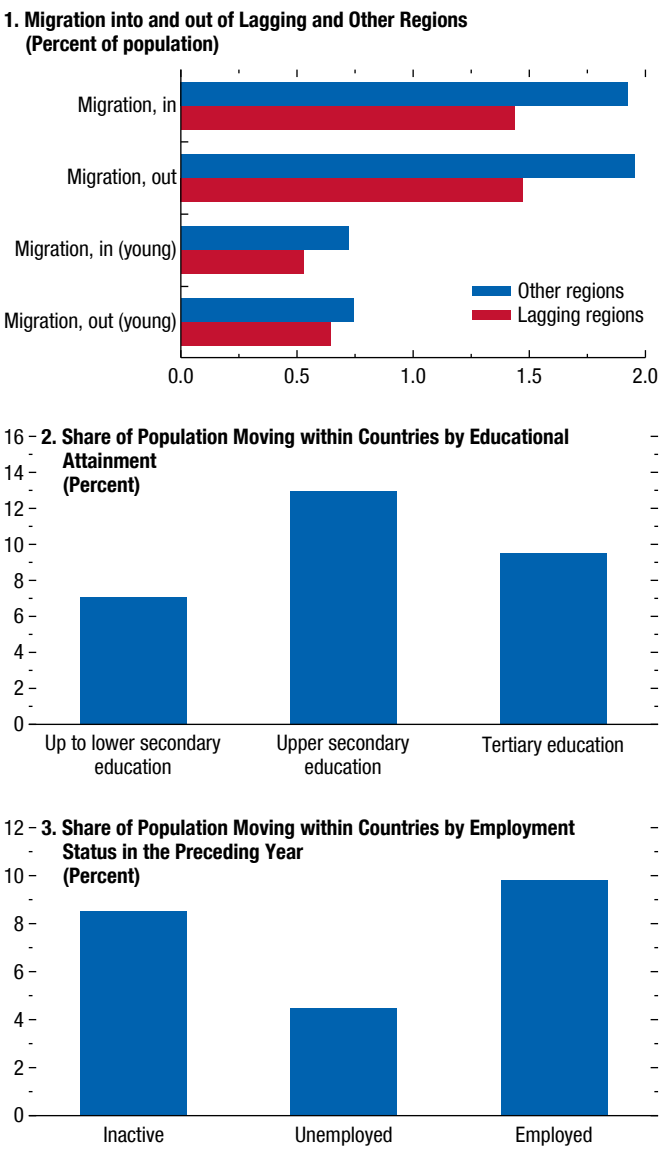
As with regional adjustment dynamics, national-level structural policies and distortions may affect the variability in firms' allocative efficiencies across regions of a country by creating incentives for more or less efficient firm choices. The analysis indicates that national policies that support greater flexibility and openness in product markets are associated with lower variability of firms' allocative efficiency across regions of a country (Figure 2.14). In particular, countries with less stringent product market regulation (related to the level of protection for incumbent firms), lower administrative costs for starting a business, and greater trade openness, are all associated with lower variability in capital allocative efficiency across regions. These associations might reflect the selective effects of more competitive and contestable markets on firms, pushing allocative efficiency across regions closer together, and of the beneficial effects of greater flexibility for factors to be reallocated by individual firms and also across firms.

[27]See Online Annex 2.5 for further details on the incidence of import competition from China and automation shocks for lagging versus other regions.

[28]See Online Annex 2.6 for further details on the construction of the measure. The ratio of the standard deviation to the mean of a distribution is also known as the coefficient of variation.

Figure 2.13. Subnational Regional Migration and Labor Mobility

Gross migration flows tend to be smaller in lagging regions. The better educated and employed are more likely to migrate within a country.

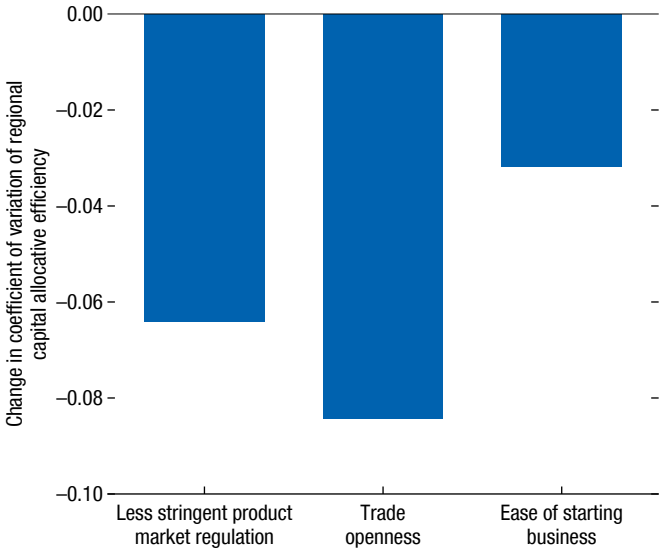


Sources: Organisation for Economic Co-operation and Development Regional Database; European Union (EU) Labor Force Survey; and IMF staff calculations.
Note: Panel 1 shows migration into and out of lagging regions versus other regions between 2000–16, defined as gross inflows and outflows of migrants divided by the population in the previous period in the region. Lagging regions in a country are defined as those with real GDP per capita below country regional median in 2000 and with average growth below the country's average over 2000–16. Panel 2 plots the share of the population who moved within the past year by education level, based on individual worker level data from the EU Labor Force Survey between 2000–16. Lower secondary education indicates educational attainment less than 9 years, upper secondary education between 9 and 12 years, and tertiary education greater than 12 years. Panel 3 plots the share of the population who moved within the past year by employment status, based on individual worker level data from the EU Labor Force Survey between 2000–16. See Online Annex 2.1 for the country sample.

Figure 2.14. Effects of National Structural Policies on Subnational Regional Dispersion of Capital Allocative Efficiency

(Response to one standard deviation increase in indicated policy variable)

The regional dispersion of firms' allocative efficiency—the responsiveness of their investment to capital returns—tends to be lower in countries where national policies support more open markets.



Source: IMF staff calculations.
Note: Bars show the associated average change in the coefficient of variation of regional capital allocative efficiency, calculated by country-sector-year, for a one standard deviation change in the indicated structural policy variable. All effects shown are statistically significant at the 10 percent level. Regression controls for country-sector and sector-year fixed effects, with standard errors clustered at the country-year level. See Online Annex 2.1 for the country sample and Online Annex 2.6 for further details on the econometric methods.

Summary and Policy Implications

The regional dimension of economic performance has generated much interest in recent years, reflecting the perception that increasing regional differences in growth and employment opportunities in advanced economies are stoking social unease and distrust, as some regions and peoples are left behind. The chapter shows that while there is a grain of truth in these contentions, the size and scope of regional disparities differs markedly across economies. Regional disparities are closely associated with differences in the sectoral composition of employment and levels of sectoral productivity. Lagging regions of a country are more likely to have lower labor productivity across sectors and to be more concentrated in agriculture and industry than in services (and particularly high productivity growth service sectors, such as information technology

and communications). They also tend to have smaller populations of prime-age workers than other regions, which may contribute further to their poorer productivity performance (Feyrer 2007; Adler and others 2017).

Regional adjustment to adverse local labor demand shocks generally takes time and is associated with higher unemployment, reflecting frictions in shifting production and employment across sectors and labor mobility. Lagging regions do not appear more likely to be hit by these shocks, but they do appear to suffer more in response to some—in particular shocks related to differences in exposure to technological changes—suggesting that adjustment mechanisms in lagging regions may be more obstructed than in other regions.

How might policies reduce these disparities and promote improved regional adjustment? The analyses here and in earlier literature suggest several possible actions. As noted earlier, the consensus is that human capital plays a pivotal role in driving regional development. Boosting educational and training quality and opportunities where there are gaps, as well as introducing more broad-based educational reforms to improve learning outcomes and adapt to the changing world of work, would disproportionately benefit lagging regions (see also Coady and Dizioli 2017 and WB 2018, 2019a). Similarly, deploying more active labor market policies to create jobs, retrain the displaced, and find new job matches for the unemployed could also help lift lagging regions and ease adjustment. However, the design of active labor market policies matters enormously for their success. They must be carefully tailored to address the labor market failures specific to a region's context and assessed and improved regularly (Card, Kluve, and Weber 2018).

National labor and product market policies and distortions also affect regional adjustment and factor reallocation (Dabla-Norris and others 2015; Boeri and others 2019). Evidence presented here suggests that the appropriate calibration of employment protection regulations and unemployment insurance regimes can facilitate regional labor market adjustment, dampening the unemployment effects of adverse shocks. Greater flexibility can also be helpfully accompanied by stronger retraining and other forms of job assistance to help ensure displaced workers achieve any necessary reskilling and reemployment rapidly (Aiyar and others 2019).[29] Product markets that are more open—through lower barriers to entry and greater trade openness—are associated with lower variability in the capital allocative efficiencies of firms across the regions of a country, which is in turn associated with lower regional disparities. More competitive markets within a country are associated with greater efficiency in the reallocation of capital, both in and across regions.

Although not a focus of the analysis here owing to data constraints, spatially targeted, place-based fiscal policies and investments may also help lagging regions, but only when need is spatially concentrated and individual-level targeting has been less effective (Box 2.4 explores place-based policies and offers more in-depth discussion). There is evidence that greater fiscal decentralization, which effectively enables more spatially differentiated policies, may also help reduce regional disparities (Lessmann 2009; Kappeler and others 2013; Blöchliger, Bartolini, and Stossberg 2016). Austin, Glaeser, and Summers (2018) argues that explicit spatial targeting may also be justified if some regions are more sensitive to fiscal interventions than others—for example, if an area has greater labor market slack because local demand conditions are depressed. However, place-based policies must be carefully designed to ensure that beneficial adjustment is encouraged rather than resisted (Kline and Moretti 2014) and to avoid interfering with the continued success of leading regions (Barca, McCann, and Rodríguez-Pose 2012; Pike, Rodríguez-Pose, and Tomaney 2017; Rodríguez-Pose 2018).

[29]For example, see the Danish model of "flexicurity," which accompanies great flexibility in hiring and firing, with retraining, job matching, and unemployment benefits that are subject to strong monitoring and conditionality (OECD 2016a).

Box 2.1. Measuring Subnational Regional Economic Activity and Welfare

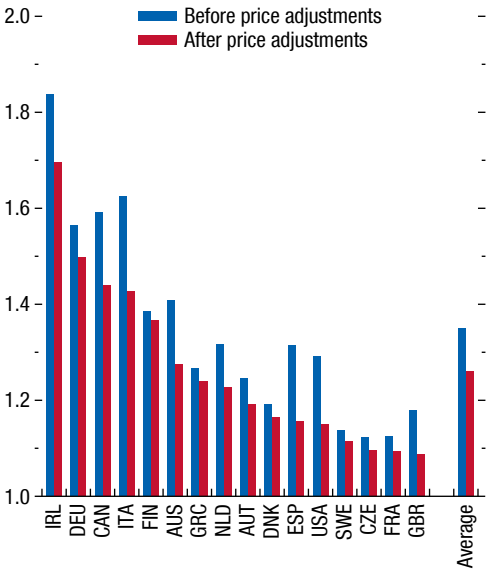
Although real GDP per capita has many shortcomings as a measure of individual well-being and social welfare, it remains a touchstone in much economic analysis and cross-country comparisons.[1] Recent research suggests that it is also still useful as a broad metric for cross-country comparisons, finding it highly correlated for a large set of indicators based on various aspects of human welfare (including subjective well-being, mortality, inequality, and leisure).[2] However, in the case of within-country regional comparisons, two issues arise that can complicate the welfare interpretation of patterns of real GDP per capita—regional price or cost-of-living differences and the effects on personal income of fiscal redistribution and income flows to and from elsewhere.

Although real GDP per capita is typically corrected for average cross-country differences in cost-of-living (purchasing power parity adjustments), regional differences in the cost-of-living are often not fully reflected in regional real GDP per capita measures, largely because regional price indexes are not broadly available.[3] Gennaioli and others (2014) attempts to correct for this for a subset of countries in its global data set, using housing cost differences as a proxy for the cost of living. The study finds that, although the size of regional disparities fell, they remained substantial. Gbohoui, Lam, and Lledo (2019) undertakes a similar calculation using more recent data. As shown in Figure 2.1.1, it also finds that regional disparities (as captured by the ratio of real GDP per capita in the 75th to the 25th percentile region within-country) narrowed with the correction, but remained significant, with the ratio going from 1.34 to 1.26, on average. Hence, although regional price differences are part of the picture, they do not account for all regional disparities in economic activity.

Real GDP per capita is a measure of real output or economic activity occurring within a territory over a given period (UN 2009). It is not a measure of an individual's or household's income available for their consumption and investment, which would be a more direct measure of welfare. This is more properly captured by disposable income—the sum of labor compensation and investment income after taxes and transfers.[4] Given that disposable income incorporates income streams from elsewhere, such as capital income from geographically diversified portfolios, it can better capture interregional risk sharing and result in narrower regional disparities.[5] Fiscal

Figure 2.1.1. Subnational Regional Disparities: Before and after Regional Price Adjustment

(Ratio for the interquartile range of real GDP per capita across subnational regions by country during 2010–14)



Source: Gbohoui, Lam, and Lledo (2019).
Note: Constructed from Organisation for Economic Co-operation and Development Regional Database, Gennaioli and others (2014), and Luxembourg Income Study for available years. The price adjustment is based on the housing deflator. Data labels use International Organization for Standardization (ISO) country codes.

The author of this box is John Bluedorn, with contributions from William Gbohoui, W. Raphael Lam, and Victor Lledo.

[1]See Fleurbaey (2009); Coyle (2015); Feldstein (2017); and Stiglitz, Fitoussi, and Durand (2018), among others.

[2]See Stevenson and Wolfers (2008) and Jones and Klenow (2016) for evidence.

[3]See Feenstra, Inklaar, and Timmer (2015) for a discussion of the purchasing power parity adjustment of GDP measures and OECD (2018) for details on the construction in the OECD Regional Database.

[4]See OECD (2013, 2018) for further details on disposable income and its construction and availability at the region-level.

[5]Asdrubali, Sørensen, and Yosha (1996) leverages this fact to estimate the extent of interregional risk-sharing within the United States.

Box 2.1 *(continued)*

redistribution through taxes and transfers within and across regions can provide a further channel for narrowing income differences across regions.[6] For the limited countries and years for which data on regional disposable income per capita are available, regional differences are smaller than they are as measured by real GDP per capita differences, but again, can be substantial (OECD 2018). For example, the top income regions in the United States had average disposable income per capita more than 50 percent higher than the national average.

With its wider availability across time and countries, regional real GDP per capita remains the best measure for assessing the extent and evolution of regional differences in economic activity. However, recognizing its drawbacks as a measure of welfare and motivated by the extensive evidence on the pivotal role of employment in individual's life satisfaction, the chapter's analysis focuses more on regional labor market outcomes and adjustment, paralleling some of the latest research (Austin, Glaeser, and Summers 2018).

[6]See Obstfeld and Peri (1998) and Boadway and Shah (2007) for a discussion of the role of fiscal redistribution in facilitating adjustment.

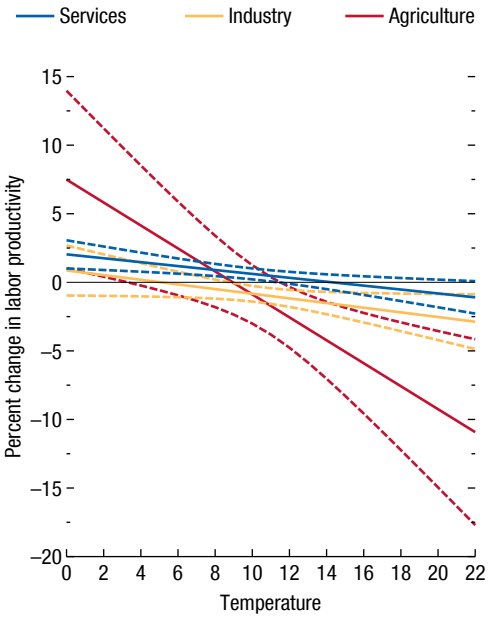
Box 2.2. Climate Change and Subnational Regional Disparities

Climate change may further exacerbate subnational regional disparities in many advanced economies by the end of the 21st century. This conclusion is based on two findings. First, estimates of the effect of temperature increases on sectoral labor productivity—agriculture, industry, and services—at the subnational level indicate that agriculture and industry are likely to suffer, even in advanced economies. Second, because lagging regions tend to specialize in agriculture and industry (see Figure 2.9), the negative effect of global warming on labor productivity may be larger in lagging regions, therefore pushing them to fall behind even more by the end of the 21st century.[1]

Analysis at the country-level, presented in Chapter 3 of the October 2017 *World Economic Outlook*, already establishes that a 1.0°C increase in temperature lowers labor productivity in heat-exposed industries (mostly agriculture and industry), while there is no negative effect on non-heat-exposed industries (mostly services).[2] It also shows little adaptation to climate change, except in advanced economies. Because the analysis in this box focuses only on the advanced economies, which have already invested in climate adaptation, any negative effects uncovered here are likely to be at the lower bound of estimates in a global sample.

In general, temperature has a nonlinear effect on economic activity—in very cold regions, warming may bring economic benefits. Beyond a certain "optimal" level, temperature increases hurt economic output and labor productivity. However, there is significant heterogeneity in the relationship between temperature and labor productivity across sectors, as Figure 2.2.1 demonstrates.[3] For example, for a median lagging region, which has an average annual temperature of 12°C in this sample, an increase in temperature by 1°C would reduce labor productivity in the agriculture and industry sectors and have no effect on the service sector. In contrast, because the median non-lagging region is at 10.5°C, an increase in average annual temperature by 1°C would raise productivity in the service sector, lower it in the industry sector, and have no statistically significant effect on the agriculture sector.

Figure 2.2.1. Marginal Effect of 1°C Increase in Temperature on Sectoral Labor Productivity



Sources: Organisation for Economic Co-operation and Development (OECD) Regional Database; University of East Anglia, Climate Research Unit; and IMF staff calculations.
Note: The figure shows the contemporaneous effect of a 1°C increase in temperature on sectoral labor productivity. Because temperature has a nonlinear effect, its marginal effect is shown at each level of regional average annual temperature. The baseline specification mirrors that of Chapter 3 of the October 2017 *World Economic Outlook* but is reestimated in a sample of subnational regions within advanced economies with a population of at least a quarter million. The industry sector includes industry, manufacturing, and construction from the OECD classification (ISIC Revision 4). Sectoral labor productivity is defined as sectoral gross value added divided by the number of employees in that sector. The dependent variable is the growth of sectoral labor productivity, and it is regressed on average annual population-weighted temperature, temperature squared, precipitation, and precipitation squared, controlling for one-year lags of all the climate variables, a lag of the dependent variable and subnational regional fixed effects. The solid lines show the point estimates for each sector, and the dashed lines show 90 percent confidence intervals. Standard errors are clustered at the level of subnational regions.

The author of this box is Natalija Novta.

[1]See also the October 2019 *Fiscal Monitor* for analysis examining how climate change mitigation policies may differentially impact regions within a country, depending on their industry mix.

[2]Heat-exposed industries include forestry, fishing and hunting, construction, mining, transportation, utilities, and manufacturing, following the classification by Graff Zivin and Neidell (2014).

[3]Based on the estimates in Figure 2.2.1, the optimal temperature is about 14°C for the service sector, but only 5°C and 9°C for industry and agriculture sectors, respectively.

Box 2.2 *(continued)*

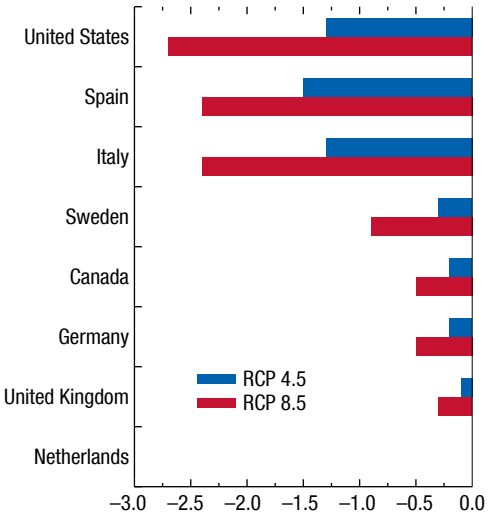
Given these findings, it is not surprising that lagging (warmer) regions might be expected to fall further behind in the coming decades. In the early 2000s, labor productivity in lagging regions was, on average, at about 85 percent of that in other regions (Figure 2.9). Under an unmitigated climate change scenario (Representative Concentration Pathway (RCP) 8.5),[4] labor productivity in lagging regions could fall by about 2–3 percentage points in Italy, Spain, and the United States by 2100 (Figure 2.2.2). This is similar to the decline in relative labor productivity of the lagging regions between 2002 and 2014 (Figure 2.9). Under a milder scenario, which assumes emissions peaking around 2050 (RCP 4.5), the decline in labor productivity of lagging regions would be smaller, at about 1.5 percentage points.

Historical weather patterns may have already contributed to some regions falling behind. An increase in a region's average annual temperature by 1°C increases the probability of being lagging by about 2 percentage points or about 10 percent relative to the baseline likelihood of about 20 percent, even after controlling for country-year fixed effects. This means that a hypothetical move from the coolest to the warmest region within a country, which have a median temperature difference of about 5.5°C, is associated with about an 11 percentage point higher chance of being lagging.

Finally, it is important to note that, even though climate change is a relatively slow process, it is very persistent and its negative effects have historically been extremely hard to eliminate. Therefore, even the seemingly small absolute effects demonstrated here should be a cause for concern, especially because they appear in the context of advanced economies that are relatively well-adapted and tend to have temperate climates.

[4]As constructed by the Intergovernmental Panel on Climate Change.

Figure 2.2.2. Change in Labor Productivity of Lagging versus Other Regions Due to Projected Temperature Increases between 2005 and 2100
(Percentage points)



Sources: National Aeronautics and Space Administration temperature projections for scenarios RCP 4.5 and 8.5; Organisation for Economic Co-operation and Development Regional Database; and IMF staff calculations.
Note: To construct the figure, the following procedure is followed: first, for 2005, the ratio of labor productivity in lagging regions relative to other regions is calculated as the weighted average of labor productivities in agriculture, industry, and services; second, the mean projected temperature increases for 2005–2100 under RCP scenarios 4.5 and 8.5 and the estimated sectoral labor productivities are used to project sectoral labor productivity at the level of subnational regions in 2100 under each of the two RCP scenarios; and, finally, the difference between the projected labor productivity of lagging regions (relative to others) in 2100 and actual labor productivity of lagging regions (relative to others) in 2005 is calculated. Representative Concentration Pathways (RCP) are scenarios of greenhouse gas concentrations, constructed by the Intergovernmental Panel on Climate Change (IPCC 2014). RCP 4.5 is an intermediate scenario, which assumes emissions peaking around 2050 and declining thereafter. RCP 8.5 is an unmitigated scenario in which emissions continue to rise throughout the 21st century.

Box 2.3. The Persistent Effects of Local Shocks: The Case of Automotive Manufacturing Plant Closures

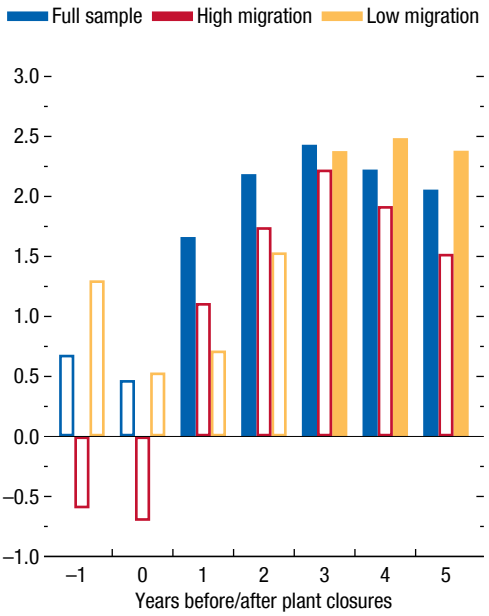
The declining share of manufacturing jobs in overall employment over the past decades has attracted attention in recent years due to concerns that manufacturing might play a role as a catalyst for productivity growth and income convergence and be a source of well-paid jobs for less-skilled workers (Chapter 3 of the April 2018 *World Economic Outlook* presents in-depth analysis of this contention). Factory closures have accompanied this trend, with job losses sometimes concentrated in particular regions within countries. A large literature exists on the local labor market impacts of factory closures, with most early studies focused on closures affecting heavy industry, such as coal, steel, and shipbuilding.[1] In more recent years, the effects of automotive manufacturing plant closures have become the focus of more studies, although most examine the effects for a single country or of a specific closure.[2]

With these in mind, this box looks at the impact of automotive manufacturing plant closures—events caused by forces originating outside the immediate region—on the regional labor markets for a sample of six advanced economies for which historical data on automotive factory closures are available.[3] The box compares unemployment rates in regions that experienced car factory closures during 2000–16 and in regions in the same country that did not experience such shocks. If regions of a country were adept at reallocating labor and capital, they could absorb shocks, including permanent shocks, and show no persistent effects on local activity and employment and little difference between the two groups of regions.

The analysis suggests that regions that experienced car factory closures typically had bigger increases in unemployment rates after the closures than comparator regions in the same countries, with the difference being statistically significant. Regressing regional unemployment rates on a dummy variable for whether the region experienced at least one plant closure points to significant and persistent effects, even after controlling for differences between regions' employment shares in industry, initial real GDP per capita, population density, and dependency ratios (Figure 2.3.1, full sample). Unemployment rates in regions with car factory closures increase for three years after the shock as the initial impact of the closure is magnified by local spillover effects to other sectors.[4]

Out-migration is expected to be a key adjustment mechanism after automotive factory closures, if other local employment options are insufficient.

Figure 2.3.1. Associations between Automotive Manufacturing Plant Closures and Unemployment Rates
(Percentage point change in unemployment rate)



Sources: Organisation for Economic Co-operation and Development Regional Database; and IMF staff calculations.
Note: The figure shows coefficient estimates from regressions of the unemployment rate on a dummy variable for whether the region experienced at least one plant closure, controlling for initial GDP per capita, population density, share of employment in industry, and the dependency ratio. Solid bars indicate statistical significance at the 10 percent level while hollow bars do not. High and low migration refer to gross migration flows split at the sample median.

The author of this box is Zsóka Kóczán.

[1]See Martin and Rowthorn (1986); Pinch and Mason (1991); Hinde (1994); Kirkham and Watts (1998); Tomaney, Pike, and Cornford (1999); Shutt, Henderson, and Kumi-Ampofo (2003); and Henderson and Shutt (2004); among others.

[2]See Chapain and Murie (2008), Ryan and Campo (2013), Bailey and others (2014), and Stanford (2017) for recent examples.

[3]The sample of countries includes Australia, Canada, Germany, Italy, the United Kingdom, and the United States, covering 2000–16. Over the period, 30 closures were recorded in these countries.

[4]See Goldstein (2017) for vivid descriptions of such effects.

Box 2.3 *(continued)*

To examine the role of migration, the regressions in this study are repeated separately for regions with high and low gross migration flows. The persistent unemployment effects are driven by regions with low gross migration flows. The negative effects of closures are not statistically significant in regions with high gross migration flows (Figure 2.3.1, high and low migration subsamples). The highly persistent effects of permanent automotive factory closures are consistent with adjustment being stuck in some regions, particularly those where mobility is low, potentially due to the more constrained and selective nature of migration.[5] Endogenous local demand effects and expectations about the future development of a place hit by factory closures could further reinforce the effects of such local shocks, exacerbating regional disparities within countries.

[5]See Kim (2008) and Duranton and Venables (2018) for discussions of the nature of mobile labor.

Box 2.4. Place-Based Policies: Rethinking Fiscal Policies to Tackle Inequalities within Countries

Policymakers deploy a variety of tools to reduce economic inequality, including fiscal redistribution through taxes and transfers and growth-friendly policies to improve education, health care, infrastructure, and affordable housing (October 2017 *Fiscal Monitor*). Most national policies have been spatially blind, targeting individuals based on their circumstances and characteristics, regardless of their residency. Examples of such policy measures include national disability and unemployment payments in the United States and unemployment benefits in France and Spain, which are targeted to individuals in need or who are unemployed, irrespective of their location. However, persistent and growing regional economic disparities in some countries have increased interest in place-based or spatially targeted fiscal policies as a further way to tackle inequality.

Place-based policies intend to promote regional equity and inclusive growth and to insure against region-specific shocks (Kim and Dougherty 2018). Examples of such policies include the European Union's Regional Development Funds that support naturally disadvantaged (remote, less-developed, or disaster-stricken) subnational regions; Canada's Regional Development Agencies, which provide support to diversify regional economies and foster community development; and US enterprise zones, which provide tax credits to generate new jobs and investment. As shown in Table 2.4.1, spatially targeted interventions can differ according to their proximate objectives, spatial coverage, and fiscal instruments. The decision on what to use will depend on the nature of the underlying regional issues.

Place-based policies can boost the success of existing fiscal policies in reducing inequality if (1) the intended recipients, such as low-income households or the unemployed, are geographically concentrated; and (2) traditional nationwide means-testing approaches have limited coverage, are less progressive, or are difficult to enforce (Coady, Grosh, and Hoddinott 2004; October 2017 *Fiscal Monitor*).[1] Place-based policies may also have merit if fiscal interventions are expected to have stronger impacts on the disadvantaged in certain regions, for example, in the case of hiring incentives that might be more effective in creating jobs and growth in regions with higher unemployment rates (Austin, Glaeser, and Summers 2018). Place-based policies should ensure that interventions facilitate convergence and sectoral reallocation in response to shocks, rather than create new barriers. But policymakers should also be mindful that such policies may raise horizontal equity concerns, as individuals with

The authors of this box are William Gbohoui, W. Raphael Lam, and Victor Lledo.

[1]Limited coverage refers to the fact that, in most countries, only a portion of the households that meet the criteria to receive a transfer (for example, means-tested) actually receive the transfer. Coverage is calculated as the percent of eligible households that in fact receive the transfer.

Table 2.4.1. Examples of Place-Based Policies

Aims	Instruments	Country Programs	Coverage
Enterprise zones: attract firms to create jobs and invest	Tax incentives on investment, job creation, and corporate income taxes; streamlined regulations	US Federal Empowerment Zones	Zones and communities within the region
Cluster promotion: agglomeration of high-tech firms and research institutions	Tax incentives; public research and development spending; grants	France's Local Productive System; "High-tech Offensive" programs in Bavaria, Germany	Region at large; communities within the region
Relocation programs: Compensate people to live/relocate in selected regions	Tax exemptions on personal income tax; grants and transfers	US low-income housing tax credit; Spain's income tax credits for unemployed that relocate for jobs; Canadian Northern Economic Development initiative to retain youth in northern regions	Low-income neighborhoods

Sources: Neumark and Simpson (2014); WB (2009); and IMF staff estimates.

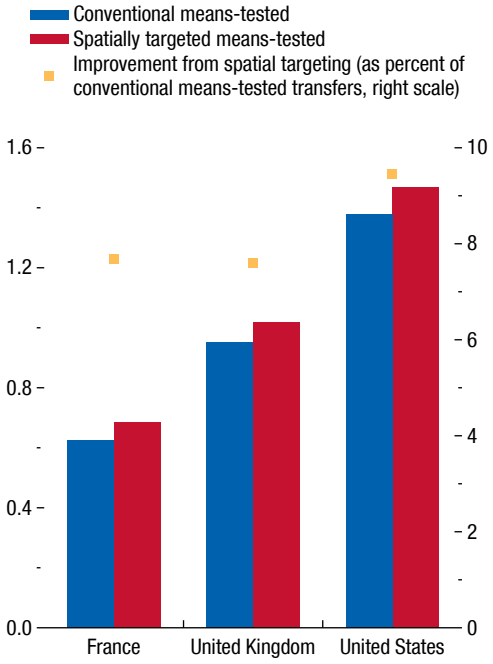
Box 2.4 *(continued)*

the same status, but living in different regions, may receive different treatment.

Drawing on individual household income surveys for a selected sample of countries, illustrative simulations suggest that combining spatial targeting with conventional means-testing programs could improve the effectiveness of fiscal redistribution—as captured by the size of the decline in income inequality—by 7–10 percent, without increasing fiscal costs (see Figure 2.4.1 and Gbohoui, Lam, and Lledo 2019 for further details). For example, because France and the United Kingdom have highly progressive social safety nets and are successful at reaching a high percentage of households eligible for transfers, the potential gains from spatial targeting are relatively small (at about 7–8 percent). But improvements are larger (about 10 percent) in the United States, where poorer households are more concentrated in lagging regions and a higher percentage of eligible households end up not receiving transfers (that is, coverage is worse).

When designing and implementing place-based policies, it is important to assign responsibilities to the appropriate level of government. The choice should be sensitive to intergovernmental fiscal arrangements within a country (for example, a unitary or federal state) and the associated revenue-raising capacity and scope for intergovernmental transfers. As a general principle, the central government should take the lead on overall policy design and monitoring, given that it can account for possible externalities and spillovers across states and provinces. Subnational governments could be more involved in the implementation, as they are more attuned to local needs and preferences. For example, in federal or highly decentralized countries, such as the United States, subnational governments have greater autonomy to determine income and property tax rates, and spending on education and health care.

Figure 2.4.1. Effects of Fiscal Redistribution by Conventional versus Spatially Targeted Means-Tested Transfers
(Reduction in Gini points, unless otherwise noted)



Sources: Luxembourg Income Study; and IMF staff calculations.
Note: The figure is based on an illustrative exercise that compares conventional (spatially blind) means-tested transfers with spatially targeted means-testing. Conventional means-tested transfers have limited coverage; that is, some percentage of eligible households do not receive the transfer (see October 2017 *Fiscal Monitor*). Spatially targeted means-testing can enhance the coverage at the same fiscal cost. The fiscal redistribution effect is defined as the difference in nationwide income inequality (Gini coefficient) before and after taxes and transfers, and is calculated separately for conventional and spatially targeted means-tested transfers. The improvement is calculated as the difference in Gini reduction, expressed as a percentage of the fiscal redistribution under conventional means-tested transfers.

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